BASIC ASSESSMENT REPORT

Draft – 27 January 2023

THE PROPOSED NAOS SOLAR PV PROJECT ONE NEAR VILJOENSKROON, FREE STATE PROVINCE

ENVIRONAMICS

PROJECT DETAIL

DFFE Reference No.	**:**	To be confirmed
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Authors	**:**	Mrs. Lisa de Lange
Reviewer	:	Mrs. Marelie Botha
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GLOSSARY OF TERMS AND ACRONYMS

BA	Basic Assessment
BAR	Basic Assessment Report
BESS	Battery Energy Storage System
CEA	Cumulative Effects Assessment
DFFE	Department of Forestry, Fisheries and the Environment
DM	District Municipality
DMRE	Department of Mineral Resources and Energy
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
EP	Equator Principles
EPFI	Equator Principles Financial Institutions
Environmental impact	Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's environmental aspects.
GNR	Government Notice Regulation
I&AP	Interested and affected party
IDP	Integrated Development Plan
IFC	International Finance Corporation
IPP	Independent Power Producer
kV	Kilo Volt
Mitigate	Activities designed to compensate for unavoidable environmental damage.
MW	Megawatt
NEMA	National Environmental Management Act No. 107 of 1998
NERSA	National Energy Regulator of South Africa
NWA	National Water Act No. 36 of 1998
PPP	Public Participation Process
PV	Photovoltaic
REDZ	Renewable Energy Development Zone
REIPPP	Renewable Energy IPP Procurement Process
SAHRA	South African Heritage Resources Agency
SDF	Spatial Development Framework
SPP	Solar Power Plant
VU	Vegetation Unit

CONTEXT FOR THE DEVELOPMENT

According to Eskom, the demand for electricity in South Africa has been growing at approximately 3% per annum. This growing demand, fuelled by increasing economic growth and social development, is placing increasing pressure on South Africa's existing power generation capacity. Coupled with this, is the growing awareness of environmentally responsible development, the impacts of climate change and the need for sustainable development. The use of renewable energy technologies, as one of a mix of technologies needed to meet future energy consumption requirements is being investigated as part of the national Department of Mineral Resources and Energy's (DMRE) (previously referred to as the Department of Energy) long-term strategic planning and research process.

The primary rationale for the proposed solar photovoltaic (PV) facility is to add new generation capacity from renewable energy to the national electricity mix and to aid in achieving the goal of 42% share of all new installed generating capacity being derived from renewable energy forms, as targeted by DMRE (2019 Integrated Resource Plan Update 2010-2030). The IRP also identifies the preferred generation technologies required to meet the expected demand growth up to 2030 and incorporates government objectives including affordable electricity, reduced greenhouse gas (GHG) emissions, reduced water consumption, diversified electricity generation sources and localisation and regional development. In terms of the Integrated Resource Plan Update (2019 IRP Update, 2010-2030), over the short term (of the next two or three years), clear guidelines arose; namely to continue with the current renewable bid programme with additional annual rounds of 1000MW PV, with approximately 8.4GW of the renewable energy capacity planned to be installed from PV technologies over the next twenty years.

The proposed project is intended to form part of the DMRE's Renewable Energy Independent Power Producer Procurement (REIPPP) Programme or any other programs/opportunities to generate power in South Africa. The REIPPP Programme aims to secure 14 725 Megawatts (MW) of new generation capacity from renewable energy sources, while simultaneously diversifying South Africa's electricity mix. According to the 2021 State of the Nation Address, Government will soon be initiating the procurement of an additional 11 800 MW of power from renewable energy, natural gas, battery storage and coal in line with the Integrated Resource Plan 2019 and fulfilling their commitments under the United Nations Framework Convention on Climate Change and its Paris Agreement which include the reduction of greenhouse gas emissions. Eskom, the largest greenhouse gas emitter of South Africa, has committed in principle to net zero emissions by 2050 and to increase its renewable capacity. During the 2022 State of the Nation Address it was indicated that the government had taken "firm steps" to bring additional generation capacity online as quickly as possible to close the shortfall in terms of electricity. As a result, it was confirmed that several new generation projects will be coming online over the next few years.

In response to the above, Naos Solar PV Project One (Pty) Ltd is proposing the development of a photovoltaic solar facility and associated infrastructure for the purpose of commercial electricity generation on an identified site located on one affected property namely Portion 1 of the Farm Waterford No. 53, Registration Division Viljoenskroon, Free State Province (refer to Figure A for the locality map). The project entails the generation of up to 300MW electrical power through photovoltaic (PV) technology. The total development footprint of the project will approximately be 500 hectares (including supporting infrastructure on site, however excluding the main overhead power line).

From a regional site selection perspective, this region is preferred for solar energy development due to its global horizontal irradiation value of around 2068 kwh/m^2. The region is also preferred based on its inclusion within the Klerksdorp Renewable Energy Development Zone (REDZ) 10.

EXECUTIVE SUMMARY

Like many other small and developing municipalities in the country, the Moqhaka Local Municipality, within which the Naos Solar PV Project One is proposed, faces a number of challenges in addressing the needs and improving the lives of the community. The Final Integrated Development Plan (2022-2027) of the Fezile Dabi District Municipality[1] states that it is the vision of the municipality to improve the lives of their citizens and progressively meet their economic, basic and social needs thereby restoring community confidence and trust in government. The municipality aims to achieve their key strategic goals, such as delivering quality basic services (i.e. electricity, water and sanitation) to their communities, stimulating local economic growth and to ensure sound financial management and viability within the municipality. The Moqhaka Local Municipality's Final Integrated Development Plan (2022-2027) indicates the specific key performance areas and priority areas of the municipality which include basic service delivery, good governance, local economic development and social and community development to name a few. The development of the Naos Solar PV Project One will contribute to the goals of the respective local and district municipalities that will be affected by the proposed development, albeit to a limited extent.

Naos Solar PV Project One (Pty) Ltd intends to develop a photovoltaic solar facility and associated infrastructure on Portion 1 of the Farm Waterford No. 573, Registration Division Viljoenskroon, Free State Province situated within the Moqhaka Local Municipality and the greater Fezile Dabi District Municipality. The solar facility will have a generating capacity of up to 300MW. The town of Viljoenskroon is located approximately 24km to the south and the town of Orkney is located approximately 12km east of the proposed development (refer to Figure A and Figure B for the respective locality and regional maps). The total development footprint of the project will approximately be 550 hectares (including supporting infrastructure on site, however excluding the overhead power line) as assessed as part of the Basic Assessment process. The site[2] was identified as being highly desirable due to its suitable climatic conditions, topography (i.e. in terms of slope), environmental conditions (i.e. ecological sensitivity and archaeology), proximity to a grid connection point (i.e. for the purpose of electricity evacuation into the national grid), as well as site access via a main road (i.e. to facilitate the movement of machinery, equipment, infrastructure and people during the construction phase). Grid connection infrastructure is also being proposed and assessed within this report, which includes internal power lines as well as a main grid connection to connect the facility to the national grid.

The grid connection infrastructure includes a 132kV power line to connect the facility from a collector substation to the national grid by connecting into the existing 132/400kV Mercury Main Transmission Substation (MTS). Two collector substation alternative locations are being considered and assessed,

[1] The Moqhaka Local Municipality falls within the Fezile Dabi District Municipality.

[2] The site is defined as Portion 1 of the Farm Waterford No. 573. The full extent of the site has been assessed as part of this BA process for the development by the EAP and the independent specialists.

with six grid connection corridors under assessment for the placement of the power line connecting the facility to the MTS. The grid connection corridors are 200m wide.

In terms of the National Environmental Management Act (Act 107 of 1998), with specific reference to Sections 24 and 24D, as read with GNR 324-327, as amended (2017), Environmental Authorisation is required for Naos Solar PV Project One. The following listed activities have been identified with special reference to the proposed development and is listed in the EIA Regulations (as amended):

- Activity 11(i) (GNR 327): *"The development of facilities or infrastructure for the transmission and distribution of electricity outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts."*
- Activity 12(ii)(a)(b) (GNR 327): *"The development of (ii) infrastructure or structures with a physical footprint of 100 square meters or more where such development occurs (a) within a watercourse or (b) within 32 meters of a watercourse, measured from the edge of a watercourse.*
- Activity 14 (GNR 327): *"The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres."*
- Activity 19 (GNR 327): *"The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic meters from a watercourse."*
- Activity 24 (ii) (GN.R 327): *"The development of a road (ii) with reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 meters"*
- Activity 28 (ii) (GN.R 327): *"Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 1998 and where such development (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare."*
- Activity 56 (ii) (GN.R 327): *"The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre (ii) where no reserve exists, where the existing road is wider than 8 metres…"*
- Activity 1 (GN.R 325): *"The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more."*
- Activity 15 (GN.R 325): *"The clearance of an area of 20 hectares or more of indigenous vegetation."*
- Activity 4 (b)(i)(bb)(ee)(gg) (GN.R 324): *"The development of a road wider than 4 metres with a reserve less than 13,5 metres (b) in the Free State, (i) outside urban areas and within (bb) National Protected Area Expansion Strategy, (ee) critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans and (gg) areas within 10 kilometres from national parks or world heritage sites or 5 kilometres*

from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding disturbed areas."

- Activity 10 (b)(i)(bb)(ee)(gg)(hh) (GN.R 324): *"The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres (b) in the Free State (i) outside urban areas and within (bb) National Protected Area Expansion Strategy, (ee) Critical Biodiversity Areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans*, within *(gg) areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding disturbed areas and (hh) Areas within a watercourse or wetland, or within 100 metres from the edge of a watercourse or wetland."*

- Activity 12 (b)(i)(ii)(iv) (GN.R 324): *"The clearance of an area of 300 square metres or more of indigenous vegetation (b) in the Free State (i) within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004, (ii) within critical biodiversity areas identified in bioregional plans and (iv) areas within a watercourse or wetland; or within 100 metres from the edge of watercourse or wetland."*

- Activity 14(ii)(a)(c)(b)(i)(bb)(ff)(hh) (GN.R 324): *"The development of (ii) infrastructure or structures with a physical footprint of 10 square metres or more where such development occurs (a) within a watercourse; or (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; in the (b) Free State Province, (i) outside urban areas, within (bb) National Protected Area Expansion Strategy, (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans and (hh) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve."*

- Activity 18 (b)(i)(bb)(ee)(gg)(hh) (GN.R 324): *"The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre (b) in the Free State (i) outside urban areas, within (bb) National Protected Area Expansion Strategy, (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans, (gg) areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding disturbed areas and (hh) Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland."*

Activities required for the development of the solar facility which are listed under Listing Notice 1, 2 and 3 (GNR 327, 325 & 324) implies that the development could potentially have an impact on the environment that will require mitigation. The proposed Naos Solar PV Project One is located within a Renewable Energy Development Zone (REDZ) and subsequently a Basic Assessment process is required to be followed as described in Regulations 19 and 20 of the EIA Regulations (as amended).

Environamics has been appointed as the independent Environmental Assessment Practitioner to undertake the Basic Assessment (BA) on behalf of Naos Solar PV Project One (Pty) Ltd.

Regulation 19 of the EIA Regulations (2017) requires that a Basic Assessment Report (BAR) must contain the information set out in Appendix 1 of the Regulations or comply with a protocol or minimum information requirements relevant to the application as identified and gazetted by the Minister in a government notice. Appendix 1 of GNR326 requires that the environmental outcomes, impacts and residual risks of the proposed activity be set out in the BAR. It has been determined through the BA process that the proposed development will have a net positive impact for the area and will subsequently ensure the optimal utilisation of resources and land. All negative environmental impacts can be effectively mitigated through the recommended mitigation measures and no residual negative impacts are foreseen. The potentially most significant environmental impacts associated with the development are briefly summarized below.

Impacts during the construction phase:

Construction of the solar power plant will potentially result in the following impacts: habitat destruction and fragmentation, impacts to wetland features, soil, air and water pollution, increased soil erosion and sedimentation, spread and establishment of alien invasive species, impact on priority and resident avifauna, loss of avian habitats, impact on heritage objects, impact on fossil heritage, potential loss of grazing farmland, visual impact on observers in-migration or influx of job seekers, presence of construction workers on the local communities, increased risk of veld fires, impacts on daily living and movement patterns and generation of waste. Socio-economic impacts such as the creation of local employment and business opportunities, skills development and training and technical support to local farmers and municipalities will be positive impacts emanating from the construction.

Impacts during the operational phase:

During the operational phase, the site will serve as a solar power plant and the potential impacts will take place over a period of 20 – 30 years. The negative impacts are generally associated with impacts on the fauna and flora, soils and water pollution, spread and establishment of alien invasive species, displacement of priority and resident avifauna, collisions of avifauna with PV array and power lines, visual impacts and dangerous goods hazards as part of battery storage facility (catching fire, exploding or leaking dangerous pollutants). The provision of sustainable service delivery from the local municipality also needs to be confirmed. The operational phase will have a direct positive impact through the provision of employment opportunities for its duration, and the generation of income to the local community. Additional electricity will also be generated from a clean renewable resource.

Impacts during the decommissioning phase:

The physical environment will benefit from the closure of the solar power plant since the site will be rehabilitated to an acceptable state. The decommissioning phase will however potentially result in impact on the fauna and flora, dust impacts, pressure on existing service infrastructure and the loss of permanent employment. Skilled staff will be eminently employable, and a number of temporary jobs will also be created in the process.

Cumulative impacts:

According to the DFFE's database twelve (12) PV solar plant applications (of which two applications have lapsed) have been submitted to the Department within the geographic area of investigation.

Majority of the cumulative impacts will be of a medium or low significance, with the exception of visual cumulative impacts, which is of a high significance due to the current industrial developments in the area (i.e. mining activities), as well as the amount of proposed solar energy development which will further add to the change of the landscape. Considering the extent of the project and information presented in section 7 of this report, it can be concluded that the cumulative impacts will not result in large scale changes and impacts on the environment, especially since the environment and general area has experienced transformation including the undertaking of mining and agricultural activities which has created disconnect between natural systems within the landscape.

In accordance with the EIA Regulations, this draft BAR evaluates and rates each identified potential impact and identifies and recommends mitigation measures which will be required in order to ensure the reduction of the impact significance of negative impacts to acceptable levels and the avoidance of negative residual risks. This draft BAR also contains information that is required by the competent authority (Department of Forestry, Fisheries and the Environment (DFFE)) to consider the Application for Environmental Authorisation and to reach a decision as contemplated in Regulation 20 of GNR 326.

No fatal flaws or impacts with unacceptable levels of significance were identified and the impacts from the proposed development are expected to be at an acceptable level with the implementation of mitigation measures and therefore the project can be authorised subject to the implementation of the recommended mitigation measures.

1 INTRODUCTION

This section aims to introduce the Basic Assessment Report (BAR) and specifically to address the following requirements of the regulations:

Appendix 1. (3) A basic assessment report must contain the information that is necessary for the competent authority to consider and come to a decision on the application, and must include- (a) details of: (i) the EAP who prepared the report; and (ii) the expertise of the EAP, including a curriculum vitae.

1.1 LEGAL MANDATE AND PURPOSE OF THE REPORT

The National Environmental Management Act identifies listed activities (in terms of Section 24) which are likely to have an impact on the environment. These activities cannot commence without obtaining an EA from the relevant competent authority. Sufficient information is required by the competent authority to make an informed decision and the project is therefore subject to an environmental assessment process which can be either a Basic Assessment Process or a full Scoping and Environmental Impact Assessment process.

The EIA Regulations No. 324, 325, and 327 outline the activities that may be triggered and therefore require EA. The following listed activities with special reference to the proposed development is triggered:

Table 1.1: Listed activities

Relevant notice:	**Activity No (s)**	**Description of each listed activity as per project description**:
GNR. 327 (as amended in 2017)	Activity 11(i)	• *"The development of facilities or infrastructure for the transmission and distribution of electricity (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts."* • Activity 11(i) is triggered as the proposed photovoltaic solar facility will transmit and distribute electricity of 132 kilovolts outside an urban area. The infrastructure for the distribution of electricity will include an on-site facility substation (33kV/132kV), collector substation(33kV/132kV), internal power lines (33kV/132kV) and a main overhead power line (33kV/132kV) that will connect the facility directly into the existing 132/400kV Mercury Main Transmission Substation (MTS).

GNR. 327 (as amended in 2017)	Activity 12(ii)(a)(b)	• *"The development of (ii) infrastructure or structures with a physical footprint of 100 square meters or more (a) within a watercourse or (b) within 32 meters of a watercourse, measured from the edge of a watercourse."* • Activity 12(ii)(a)(b) is triggered as an exorheic depression wetland (artificial dam) is located within the site and the development footprint of the Naos Solar PV Project One. This dam will be removed for the placement of the development footprint. Furthermore, two unchanneled valley bottom wetlands are present within all six grid connection corridors under assessment. Some of the power line pylons associated with the line may be located either within 32 meters or within the feature itself and will have a footprint of more than 100 square meters. The service road associated with the power line will also need to cross the watercourse.
GNR. 327 (as amended in 2017)	Activity 14	• *"The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres."* • Activity 14 is triggered since the proposed development will need to develop infrastructure for the storage and handling of dangerous goods (diesel and oils) in containers with combined capacity of 80 cubic metres. The capacity will not exceed 500 cubic metres. The goods are required for construction activities to be undertaken during the construction phase, including the operation of machinery and equipment, as well as during the operation phase for the undertaking of routine maintenance activities.
GNR. 327 (as amended in 2017)	Activity 19	• *"The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil sand, shells, shell grit, pebbles or rock of more than 10 cubic meters from a watercourse"* • Activity 19 is triggered as an exorheic depression wetland (artificial dam) is located within the site and the development footprint of the Naos Solar PV Project One. This dam will be removed for the placement of the development footprint.

		Furthermore, two unchanneled valley bottom wetlands are present within all six grid connection corridors under assessment. Some of the power line pylons associated with the line may be located either within 32 meters or within the feature itself and will have a footprint of more than 100 square meters. The service road associated with the power line will also need to cross the watercourse. Therefore, excavation and removal of soil will be undertaken from the surface water features of up to 4120 cubic meters.
GNR. 327 (as amended in 2017)	Activity 24(ii)	• *"The development of a road (ii) with reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 meters;"* • Activity 24(ii) is triggered as the internal roads will vary between 8 and 12 meters in width. Internal access roads will be up to 12m in width. The main access road providing direct access to the project will be up to 8m wide.
GNR. 327 (as amended in 2017)	Activity 28(ii)	• *"Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 1998 and where such development (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare."* • Activity 28(ii) is triggered as portions of the affected property have been used for grazing and crop production and the property will be re-zoned to "special" use for the proposed development. The development footprint of the Naos Solar PV Project One will be up to 550 hectares in extent.
GNR. 327 (as amended in 2017)	Activity 56 (ii):	• *"The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre (ii) where no reserve exists, where the existing road is wider than 8 metres…"* • Activity 56 (ii) is triggered as the existing access to the affected property will need to be widened by more than 6 metres. It is expected that only certain sections of the road will need to be upgraded, where relevant.
GNR. 325 (as amended in 2017)	Activity 1	• *"The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more."*

		• Activity 1 is triggered since the proposed photovoltaic solar facility will generate up to 300 megawatts electricity through the use of a renewable resource.
GNR. 325 (as amended in 2017)	Activity 15	• *"The clearance of an area of 20 hectares or more of indigenous vegetation."* • In terms of vegetation type the site falls within the Vaal-Vet Sandy Grassland and the Rand Highland Grassland which is described by Mucina and Rutherford (2006) respectively as 'endangered' and 'vulnerable'. Activity 15 is triggered since portions of the site have not been lawfully disturbed during the preceding ten years; therefore, more than 20 hectares of indigenous vegetation will be removed. The development footprint of the solar power plant will be up to 550 hectares.
GNR. 324 (as amended in 2017)	Activity 4 (b)(i)(bb)(ee)(gg)	• *"The development of a road wider than 4 metres with a reserve less than 13,5 metres (b) in the Free State, (i) outside urban areas and within (bb) National Protected Area Expansion Strategy, (ee) critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans and (gg) areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding disturbed areas."* • Activity 4(b)(i)(bb)(ee)(gg) is triggered as the internal roads will vary between 8 and 12 meters in width. Internal access roads will be up to 12m in width. The main access road providing direct access to the project will be up to 8m wide. The project is located within the Free State Province and falls outside of an urban area. The site is located within a priority focus area of the National Protected Areas Expansion Strategy and a portion of the site and development area is located within a CBA1 as identified in the Free State 2015 Biodiversity Plan. The project is located within 5km of two protected areas in terms of NEMPAA, known as Mispha Game Farm located approximately 1.8km west and the Bushbaby Private Nature Reserve located approximately 1.45 km northeast of the proposed development as per the South Africa Protected Area

		Database of the Department of Forestry, Fisheries and the Environment.
GNR. 324 (as amended in 2017)	Activity 10 (b)(i)(bb)(ee)(gg)(hh)	• *"The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres (b) in the Free State (i) outside urban areas and within (bb) National Protected Area Expansion Strategy, (ee) Critical Biodiversity Areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans, within (gg) areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding disturbed areas and (hh) Areas within a watercourse or wetland, or within 100 metres from the edge of a watercourse or wetland."* • Activity 10(b)(i)(bb)(ee)(gg)(hh) is triggered since the proposed development will need to develop infrastructure for the storage and handling of dangerous goods (diesel and oils) in containers with combined capacity of 80 cubic metres. The capacity will not exceed 500 cubic metres. The goods are required for construction activities to be undertaken during the construction phase, including the operation of machinery and equipment, as well as during the operation phase for the undertaking of routine maintenance activities. The project is located within the Free State Province and falls outside of an urban area. The site is located within a priority focus area of the National Protected Areas Expansion Strategy and a portion of the site and development area is located within a CBA1 as identified in the Free State 2015 Biodiversity Plan. The project is located within 5km of two protected areas in terms of NEMPAA, known as Mispha Game Farm located approximately 1.8km west and the Bushbaby Private Nature Reserve located approximately 1.45 km northeast of the proposed development as per the South Africa Protected Area Database of the Department of Forestry, Fisheries and the Environment. Furthermore, an exorheic depression wetland (artificial dam) is located within the site and the development footprint of

		the Naos Solar PV Project One. This dam will be removed for the placement of the development footprint. Two unchanneled valley bottom wetlands are also present within all six grid connection corridors under assessment. Some of the power line pylons associated with the line may be located either within 32 meters or within the feature itself. The service road associated with the power line will also need to cross the watercourse.
GNR. 324 (as amended in 2017)	Activity 12 (b)(i)(ii)(iv)	• *"The clearance of an area of 300 square metres or more of indigenous vegetation (b) in the Free State (i) within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004, (ii) within critical biodiversity areas identified in bioregional plans and (iv) areas within a watercourse or wetland; or within 100 metres from the edge of watercourse or wetland.."* • Activity 12(b)(i)(ii)(iv) is triggered since the site is located within the Vaal-Vet Sandy Grassland and the Rand Highland Grassland vegetation types which are described by Mucina and Rutherford (2006) respectively as 'endangered' and 'vulnerable'. The development footprint of the solar power plant will be up to 550 hectares. Furthermore, a portion of the site and development area is located within a CBA1 as identified in the Free State 2015 Biodiversity Plan. An exorheic depression wetland (artificial dam) is located within the site and the development footprint of the Naos Solar PV Project One. This dam will be removed for the placement of the development footprint. Two unchanneled valley bottom wetlands are also present within all six grid connection corridors under assessment. Some of the power line pylons associated with the line may be located either within 32 meters or within the feature itself. The service road associated with the power line will also need to cross the watercourse.
GNR. 324 (as amended in 2017)	Activity 14(ii)(a)(c)(b)(i)(bb)(ff)(hh)	• *"The development of (ii) infrastructure or structures with a physical footprint of 10 square metres or more where such development occurs (a) within a watercourse; or (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; in*

		the (b) Free State Province, (i) outside urban areas, within (bb) National Protected Area Expansion Strategy, (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans and (hh) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve." • Activity 14(ii)(a)(c)(b)(i)(bb)(ff)(hh) is triggered as an exorheic depression wetland (artificial dam) is located within the site and the development footprint of the Naos Solar PV Project One. This dam will be removed for the placement of the development footprint. Furthermore, two unchanneled valley bottom wetlands are present within all six grid connection corridors under assessment. Some of the power line pylons associated with the line may be located either within 32 meters or within the feature itself and will have a footprint of more than 100 square meters. The service road associated with the power line will also need to cross the watercourse. The project is located within the Free State Province and falls outside of an urban area. The site is located within a priority focus area of the National Protected Areas Expansion Strategy and a portion of the site and development area is located within a CBA1 as identified in the Free State 2015 Biodiversity Plan. The project is located within 5km of two protected areas in terms of NEMPAA, known as Mispha Game Farm located approximately 1.8km west and the Bushbaby Private Nature Reserve located approximately 1.45 km northeast of the proposed development as per the South Africa Protected Area Database of the Department of Forestry, Fisheries and the Environment.
GNR. 324 (as amended in 2017)	Activity 18 (b)(i)(bb)(ee)(gg)(hh)	• *"The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre (b) in the Free State (i) outside urban areas, within (bb) National Protected Area Expansion Strategy, (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans, (gg) areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding disturbed areas and (hh) Areas within a*

		watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland." • Activity 18 (b)(i)(bb)(ee)(gg)(hh) is triggered as the existing access to the affected property will need to be widened by more than 6 metres. It is expected that only certain sections of the road will need to be upgraded, where relevant. The project is located within the Free State Province and falls outside of an urban area. The site is located within a priority focus area of the National Protected Areas Expansion Strategy and a portion of the site and development area is located within a CBA1 as identified in the Free State 2015 Biodiversity Plan. The project is located within 5km of two protected areas in terms of NEMPAA, known as Mispha Game Farm located approximately 1.8km west and the Bushbaby Private Nature Reserve located approximately 1.45 km northeast of the proposed development as per the South Africa Protected Area Database of the Department of Forestry, Fisheries and the Environment. An exorheic depression wetland (artificial dam) is located within the site and the development footprint of the Naos Solar PV Project One. This dam will be removed for the placement of the development footprint. Two unchanneled valley bottom wetlands are also present within all six grid connection corridors under assessment. Some of the power line pylons associated with the line may be located either within 32 meters or within the feature itself. The service road associated with the power line will also need to cross the watercourse.

The activities triggered under Listing Notice 1, 2 and 3 (Regulation 327, 325 & 324) for the project implies that the development is considered as potentially having an impact on the environment and therefore require the implementation of appropriate mitigation measures. Based on the location of the entire extent of the project within the Klerksdorp REDZ (see Figure D), the process to be followed will be as per GNR 114, as gazetted on 16 February 2018. Therefore, the Naos Solar PV Project One is subject to a Basic Assessment process and not a full EIA process, as well as a shortened timeframe for the processing of the Application for Environmental Authorisation by the Department of Forestry, Fisheries and the Environment (DFFE). The Basic Assessment must be undertaken in line with the requirements stipulated under Regulations 19 – 20 of the EIA Regulations. According to Appendix 1 of Regulation 326, the objective of the basic assessment process is to, through a consultative process:

- Determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;

- Identify the alternatives considered, including the activity, location, and technology alternatives;
- Describe the need and desirability of the proposed alternatives;
- Through the undertaking of an impact and risk assessment process, inclusive of cumulative impacts which focused on determining the geographical, physical, biological, social, economic, heritage and cultural sensitivity of the sites and locations within sites and the risk of impact of the proposed activity and technology alternatives on these aspects to determine —
    - The nature, significance, consequence, extent, duration and probability of the impacts occurring; and
    - degree to which these impacts-
        - can be reversed;
        - may cause irreplaceable loss of resources, and
        - can be avoided, managed or mitigated; and
- Through a ranking of the site sensitivities and possible impacts the activity and technology alternatives will impose on the sites and location identified through the life of the activity to –
    - Identify and motivate a preferred site, activity and technology alternative;
    - Identify suitable measures to avoid, manage or mitigate identified impacts; and
    - Identify residual risks that need to be managed and monitored.

This report is the draft Basic Assessment Report (BAR) that has been submitted to the Department of Forestry, Fisheries and the Environment (DFFE) for review and comment, with an Application for Environmental Authorisation. According to GNR 326 all registered interested and affected parties (I&APs) and relevant State Departments (including Organs of State) must be allowed the opportunity to review and provide comment on the report. The draft BAR has been made available to registered I&APs and all relevant State Departments for a 30-day review and comment period from 27 January 2023 to 27 February 2023. The registered I&APs have been requested to provide written comments on the BAR within 30 days of receiving it. All issues identified during the review and comment period will be documented and compiled into a Comments and Response Report (Appendix C6) to be submitted as part of the Final BAR to DFFE for decision-making.

1.2 DETAILS OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP)

Environamics was appointed by the applicant as the independent EAP to conduct the BA and prepare all required reports. All correspondence to the EAP can be directed to:

Contact person:	Lisa de Lange (Opperman)
EAPASA Registration:	2020/2150
Postal Address:	14 Kingfisher Street, Tuscany Ridge Estate, Potchefstroom, 2531
Telephone:	084 920 3111 (Cell)

Electronic Mail: lisa@environamics.co.za

Regulation 13(1)(a) and (b) determines that an independent and suitably qualified and experienced EAP should conduct the BA. In terms of the independent status of the EAP, a declaration is attached as Appendix A to this report. The expertise of the EAP responsible for conducting the BA is also summarized in the curriculum vitae included as part of Appendix A.

1.3 DETAILS OF SPECIALISTS

Table 1.2 provides information of the independent specialists that have been appointed as part of the Basic Assessment process. Regulation 13(1)(a) and (b) determines that an independent and suitably qualified and experienced specialist should conduct the specialist study. In the event where the specialist is not independent, a specialist should be appointed to externally review the work of the specialist as contemplated in sub regulation (2), which must comply with sub regulation 1. In terms of the independent status of the specialists, their declarations are attached as Appendix D to this report. The expertise of the specialists is also summarized in their respective curriculum vitae's.

Table 1.2: Details of specialists

Study	Prepared by	Contact Person	Postal Address	Tel	e-mail
Terrestrial Biodiveristy Impact Assessment and Wetland Impact Assessment	M van der Westhuizen	M van der Westhuizen	-	Cell: 082 257 1715	mariwesthuizen@gmail.com
Avifaunal Impact Assessment	MORA Ecological Services	Mokgatla Molepo	350 Johan Street Arcadia Pretoria 0007	Cell: 081 410 3763	mokgatla@moraecological.co.za
Heritage Impact Assessment	J van Schalkwyk Heritage Consultant	J van Schalkwyk	62 Coetzer Avenue Monument Park 0181	Cell: 076 790 6777	jvschalkwyk@mweb.co.za
Paleontological Study	Banzai Environmental (Pty) Ltd	Elize Butler	-	Cell: 084 447 8759	elizebutler002@gmail.com
Soil and Agricultural Impact Assessment	The Biodiversity Company	Matthew Mamera	-	Cell: 081 319 1225	info@thebiodiversitycompany.com
Visual Impact Assessment	Donaway Environmental Consultants	Johan Botha	30 Fouche Street Steynsrus, 9515	Tel: 082 316 7749	phala.env@gmail.com
Social Impact Assessment	Donaway Environmental Consultants	Marelie Botha	30 Fouche Street Steynsrus, 9515	Cell: 082 493 5166	phala.env@gmail.com
Agricultural Economic Assessment	PJ Botha	-	-	Cell: 082 759 2991	pietmanbotha@gmail.com

1.4 STATUS OF THE BA PROCESS

The BA process is conducted strictly in accordance with the stipulations set out in Regulations 19 – 20 and Annexure 1 of Regulation No. 326. Table 1.3 provides a summary of the BA process and future steps to be taken. It can be confirmed that to date:

- A site visit was conducted on 20 July 2022.
- Site notices were erected on 21 July 2022.
- A pre-application meeting request was submitted to DFFE on 20 July 2022. The DFFE advised on 14 September 2022 that no meeting is required for the proposed development.
- A newspaper advertisement was placed in the Klerksdorp Record on 22 July 2022 to notify the public of the Basic Assessment process and commence with the public participation process.
- An application for Environmental Authorisation and the draft BAR was submitted to the DFFE on 27 January 2023.
- The Basic Assessment report has been made available for a 30-day review and comment period from 27 January 2023 to 27 February 2023.

It is envisaged that the BA process should be completed within approximately five months of submitting the Application for EA and the BAR, i.e. by August 2022 – see Table 1.3.

Table 1.3: Project schedule

Activity	Prescribed timeframe	Timeframe
Site visit	-	20 July 2022
Placement of Site Notices		21 July 2022
Placement of advertisement		22 July 2022
Submit application form and DBAR to DFFE and I&APs (including notification of report availability)	-	27 January 2023
Public participation (DBAR)	30 Days	27 January 2023– 27 February 2023
Submit FBAR	90 Days	End February 2023
Department acknowledges receipt	10 Days	March 2023
Decision	57 Days	By May 2023
Department notifies of decision	5 Days	By May 2023

Registered I&APs notified of decision	14 Days	May 2023
Appeal	20 Days	By June 2023

1.5 SPECIALIST STUDIES IDENTIFIED IN THE DFFE SCREENING TOOL REPORT

The table included below provides an indication of the specialist studies identified by the DFFE Screening Tool Report (Appendix B), an indication of whether the studies were undertaken or not and a motivation or confirmation of the studies being included or not. A Site Verification Report is included as Appendix E of this Basic Assessment Report.

Study identified in the DFFE Screening Tool and sensitivity	Study included?	Confirmation / motivation
Agricultural Impact Assessment Sensitivity: High	Yes	An Soil and Agricultural Impact Assessment is included in Appendix D4.
Landscape / Visual Impact Assessment Sensitivity: Very High	Yes	A Visual Impact Assessment is included in Appendix D3.
Archaeological and Cultural Heritage Impact Assessment Sensitivity: Low	Yes	A Heritage Impact Assessment (including consideration of the archaeology of the area) is included in Appendix D5. This assessment is undertaken to comply with the requirements of the National Heritage Resources Act.
Palaeontological Impact Assessment Sensitivity: Very High	Yes	A Palaeontological Impact Assessment is included in Appendix D6. This assessment is undertaken to comply with the requirements of the National Heritage Resources Act.
Terrestrial Biodiversity Impact Assessment Sensitivity: Very High	Yes	A Terrestrial Biodiversity Impact Assessment is included in Appendix D1.

		This assessment has been undertaken in terms of the Protocols of GNR320 – refer to the content of the report.
Aquatic Biodiversity Impact Assessment Sensitivity: Low	Yes	A Wetland Impact Assessment is included in Appendix D8. This assessment has been undertaken in terms of the Protocols of GNR320 – refer to the content of the report.
Civil Aviation Assessment Sensitivity: Low	No	The Civil Aviation Authority has been consulted regarding the development of the project since the commencement of the EIA Process. No specific negative impacts or issues have been raised to date by the CAA regarding the project. The project is also not located within an area considered to be of a high sensitivity. Refer to Appendix E for the Site Verification Report.
Defence Assessment Sensitivity: Low	No	The sensitivity is low and therefore no assessment has been included. Refer to Appendix E for the Site Verification Report.
RFI Assessment Sensitivity: Medium	No	A small section of the affected property infringes into a 1km buffer from a telecommunications facility. However, the remaining extent of the property is indicated as being of a low sensitivity. The South African Radio Astronomy Observatory (SARAO) has been consulted regarding the development of the project since the commencement of the EIA Process. No specific negative impacts or issues have been raised

		to date by the SARAO regarding the project. The project is also not located within an area considered to be of a high sensitivity. OpenServe has also been consulted regarding the development of the project since the commencement of the EIA Process. Refer to Appendix E for the Site Verification Report.
Geotechnical Assessment Sensitivity: Not indicated	No	The assessment of geotechnical considerations of the site is considered to be a technical aspect and not an environmental aspect. Therefore, the Geotechnical Asessment will be undertaken by the Applicant as part of the micro-siting process and prior to the commencement of the construction phase.
Socio-Economic Assessment Sensitivity: Not indicated	Yes	A Social Impact Assessment is included in Appendix D7.
Plant species Assessment Sensitivity: Medium	Yes	A Terrestrial Biodiversity Impact Assessment is included in Appendix D1, which also includes an assessment of the plant species present within the site. This assessment has been undertaken in terms of the Protocols of GNR320 – refer to the content of the report.
Animal Species Assessment Sensitivity: Medium	Yes	A Terrestrial Biodiversity Impact Assessment is included in Appendix D1, which also includes an assessment of the animal species present within the site.

		This assessment has been undertaken in terms of the Protocols of GNR320 – refer to the content of the report.

It must be noted that the DFFE Screening Tool Report indicates that the avian sensitivity for the site is of a low sensitivity, however an Avifaunal Impact Assessment is not indicated as being required for the proposed development. An Avifaunal Impact Assessment (Appendix D2) has however been undertaken for the development as the site is located just south of the Vaal River and to ensure that the Basic Assessment considers the impact of the development on avifauna as per the requirements of the BirdLife South Africa Best Practice Guidelines for the development of solar energy facilities.

1.6 STRUCTURE OF THE REPORT

This report is structured in accordance with the prescribed contents stipulated in Appendix 1 of Regulation No. 326. It consists of seven sections demonstrating compliance to the specifications of the regulations as illustrated in Table 1.4.

Table 1.4: Structure of the report

Requirements for the contents of a BAR as specified in the Regulations		Section in report
Appendix 1. (3) - A basic assessment report must contain the information that is necessary for the competent authority to consider and come to a decision on the application, and must include-		
(a)	details of -	1
	(i) the EAP who prepared the report; and	
	ii) the expertise of the EAP, including a curriculum vitae.	
(b)	the location of the activity, including-	2
	(i) the 21-digit Surveyor General code of each cadastral land parcel;	
	(ii) where available, the physical address and farm name;	
	(iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	
(c)	a plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is-	

	(i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or	
	(ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	
(d)	a description of the scope of the proposed activity, including-	
	(i) all listed and specified activities triggered and being applied for; and	
	(ii) a description of the activities to be undertaken including associated structures and infrastructure.	
(e)	a description of the policy and legislative context within which the development is proposed including:	
	(i) An identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks, and instruments that are applicable to this activity and have been considered in the preparation of the report; and	3
	(ii) How the proposed activity complies with and responds to the legislation and policy context, plans, guidelines, tools frameworks and instruments;	
(f)	a motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location;	4
(g)	A motivation for the preferred site, activity and technology alternative.	
(h)	a full description of the process followed to reach the preferred alternative within the site including –	
	(i) details of all the alternatives considered;	
	(ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;	5
	(iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them.	
	(iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	

	(v) the impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts- (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated;	
	(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives;	
	(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	
	(viii) the possible mitigation measures that could be applied and level of residual risk;	
	(ix) the outcomes of the site selection matrix;	
	(x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such; and	
	(xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity;	6 & 7
(i)	a full description of the process undertaken to identify, assess and rank the impacts the activity will impose on the preferred location through the life of the activity, including -	
	(i) a description of all environmental issues and risks that were identified during the EIA process; and	
	(ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures.	
(j)	an assessment of each identified potentially significant impact and risk, including-	
	(i) cumulative impacts;	
	(ii) the nature, significance and consequences of the impact and risk;	
	(iii) the extent and duration of the impact and risk;	
	(iv) the probability of the impact and risk occurring;	
	(v) the degree to which the impact and risk can be reversed;	

	(vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and	
	(vii) the degree to which the impact and risk can be mitigated;	
(k)	where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report;	6
(l)	an environmental impact statement which contains-	8
	(i) a summary of the key findings of the environmental impact assessment:	
	(ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and	
	(iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;	
(m)	based on the assessment, and where applicable, impact management measures from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr;	
(n)	Any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;	Not applicable
(o)	a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;	8
(p)	a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	
(q)	where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded, and the post construction monitoring requirements finalised;	Not applicable
(r)	an undertaking under oath or affirmation by the EAP in relation to-	
	(i) the correctness of the information provided in the report;	

	(ii) the inclusion of comments and inputs from stakeholders and interested and affected parties (I&APs);	Appendix A to the report
	(iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and	
	(iv) any information provided by the EAP to I&APs and any responses by the EAP to comments or inputs made by I&APs; and	
(s)	where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	Not applicable
(t)	any specific information that may be required by the CA; and	Not applicable
(u)	any other matters required in terms of section 24(4)(a) and (b) of the Act.	Not applicable

2 ACTIVITY DESCRIPTION

This section aims to address the following requirements of the regulations:

Appendix 1. (3) An BAR (...) must include-

(b) the location of the activity, including-

(i) the 21-digit Surveyor General code of each cadastral land parcel;

(ii) where available, the physical address and farm name;

(iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;

(c) a plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is-

(i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or

(ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;

(d) a description of the scope of the proposed activity, including-

(i) all listed and specified activities triggered and being applied for;

(ii) a description of the associated structures and infrastructure related to the development.

2.1 THE LOCATION OF THE ACTIVITY AND PROPERTY DESCRIPTION

The activity entails the development of a photovoltaic solar facility and associated infrastructure on Portion 1 of the Farm Waterford No. 573, Registration Division Viljoenskroon, Free State Province situated within the Moqhaka Local Municipality and the greater Fezile Dabi District Municipality. The town of Viljoenskroon is located approximately 24km to the south and the town of Orkney is located approximately 12km east of the proposed development (refer to Figure A and Figure B for the respective locality and regional maps).

The project entails the generation of up to 300MW electrical power through the operation of photovoltaic (PV) panels. The total development footprint of the project will approximately be 550 hectares (including supporting infrastructure on site, however excluding the overhead power line) as assessed as part of the Basic Assessment process, which is located within the affected property – refer to Table 2.1 for general site information.

The property on which the facility is to be constructed will be leased by Naos Solar PV Project One (Pty) Ltd from the property owner for the lifespan of the project (minimum of 30 years).

Table 2.1: General site information

Description of affected farm portions	Naos Solar PV Project One Portion 1 of the Farm Waterford No. 573 Power Line Alternatives 1A, 1B and 1C (1B is the technically preferred alternative) Portion 1 of the Farm Waterford No. 573 Portion 1 La Reys Kraal Zuid No. 165 Portion 2 of the Farm Kleinfontein No. 369 Remaining Extent of the Farm Kleinfontein No. 369 Portion 2 of the Farm Zaaiplaats No. 190 Portion 3 of the Farm Zaaiplaats No. 190 Portion 2 of the Farm Biesiefontein No. 173 Farm Doornplaats 599 Power Line Alternative 2 Portion 1 of the Farm Waterford No. 573 Portion 1 La Reys Kraal Zuid No. 165 Portion 2 of the Farm Kleinfontein No. 369 Remaining Extent of the Farm Kleinfontein No. 369 Portion 2 of the Farm Zaaiplaats No. 190 Portion 3 of the Farm Zaaiplaats No. 190 Portion 2 of the Farm Biesiefontein No. 173 Power Line Alternative 3 Portion 1 of the Farm Waterford No. 573 Portion 1 La Reys Kraal Zuid No. 165 Portion 1 of the Farm Kleinfontein No. 369 Portion 2 of the Farm Kleinfontein No. 369 Remaining Extent of the Farm Kleinfontein No. 369 Portion 3 of the Farm Zaaiplaats No. 190 Portion 2 of the Farm Biesiefontein No. 173 Power Line Alternative 4 Portion 1 of the Farm Waterford No. 573 Portion 2 of the Farm Waterford No. 573 Portion 2 of the Farm Biesiefontein No. 173 Portion 4 of the Farm Biesiefontein No. 173 Remaining Extent of the Farm Biesiefontein No. 173 Portion 1 of the Farm Kleinfontein No. 369 Portion 3 of the Farm Zaaiplaats No. 190
Province	Free State

District Municipality	Fezile Dabi District Municipality
Local Municipality	Moqhaka Local Municipality
Ward numbers	22
Closest towns	The town of Viljoenskroon is located approximately 24 km south of the proposed developments.
21 Digit Surveyor General codes	<u>Naos Solar PV Project One</u> Portion 1 of the Farm Waterford No. 573 - F03600000000057300001 <u>Power Line Alternatives 1A, 1B and 1C (1B is the technically preferred alternative)</u> Portion 1 of the Farm Waterford No. 573 - F03600000000057300001 Portion 1 La Reys Kraal Zuid No. 165 - F03600000000016500001 Portion 2 of the Farm Kleinfontein No. 369 - F03600000000036900002 Remaining Extent of the Farm Kleinfontein No. 369 - F03600000000036900000 Portion 2 of the Farm Zaaiplaats No. 190 - F03600000000019000002 Portion 3 of the Farm Zaaiplaats No. 190 - F03600000000019000003 Portion 2 of the Farm Biesiefontein No. 173 - F03600000000017300002 Farm Doornplaats 599 - F03600000000059900000 <u>Power Line Alternative 2</u> Portion 1 of the Farm Waterford No. 573 - F03600000000057300001 Portion 1 La Reys Kraal Zuid No. 165 - F03600000000016500001 Portion 2 of the Farm Kleinfontein No. 369 - F03600000000036900002 Remaining Extent of the Farm Kleinfontein No. 369 - F03600000000036900000 Portion 2 of the Farm Zaaiplaats No. 190 - F03600000000019000002 Portion 3 of the Farm Zaaiplaats No. 190 - F03600000000019000003

	Portion 2 of the Farm Biesiefontein No. 173 - F03600000000017300002 <u>Power Line Alternative 3</u> Portion 1 of the Farm Waterford No. 573 - F03600000000057300001 Portion 1 La Reys Kraal Zuid No. 165 - F03600000000016500001 Portion 1 of the Farm Kleinfontein No. 369 - F03600000000036900001 Portion 2 of the Farm Kleinfontein No. 369 - F03600000000036900002 Remaining Extent of the Farm Kleinfontein No. 369 - F03600000000036900000 Portion 3 of the Farm Zaaiplaats No. 190 - F03600000000019000003 Portion 2 of the Farm Biesiefontein No. 173 - F03600000000017300002 <u>Power Line Alternative 4</u> Portion 1 of the Farm Waterford No. 573 - F03600000000057300001 Portion 2 of the Farm Waterford No. 573 - F03600000000057300002 Portion 2 of the Farm Biesiefontein No. 173 - F03600000000017300002 Portion 4 of the Farm Biesiefontein No. 173 - F03600000000017300004 Remaining Extent of the Farm Biesiefontein No. 173 - F03600000000017300000 Portion 1 of the Farm Kleinfontein No. 369 - F03600000000036900001 Portion 3 of the Farm Zaaiplaats No. 190 - F03600000000019000003
Type of technology	Photovoltaic solar facility
Structure Height	Panels up to 3m, buildings ~ 4m, power line ~30m, BESS ~2.8m
Surface area to be covered (Development footprint)	Naos Solar PV Project One: up to 550 ha
Structure orientation	Tracking PV with bi-facial panels. Bi-facial panels with single axis tracking is preferred over fixed-axis or double

	axis tracking systems and mono-facial panels due to the potential to achieve higher annual energy yields whilst minimising the balance of system (BOS) costs, resulting in the lowest levelized cost of energy (LCOE). The development of the PV facility will take into consideration during the final design phase the use of either mono-facial or bi-facial PV panels as well as tracker vs fixed- tilt mounting structures. Both options are considered feasible for the site.
Generation capacity	Naos Solar PV Project One: up to 300MW

The site is located in a rural area and is bordered by farms where mainly agricultural activities are undertaken and mining activities. The site survey revealed that the affected properties currently consist of grazing cattle as well as crop production (where possible) – refer to plates 1-13 for photographs of the development area.

Further to the Basic Assessment process being undertaken for the Naos Solar PV Project One, two other solar energy facilities are proposed directly adjacent to the development under assessment. These two developments are known as Naos Solar PV Project Two and Naos Solar PV Project Three which are proposed by Naos Solar PV Project Two (Pty) Ltd and Naos Solar PV Project Three (Pty) Ltd.

The Naos Solar PV Project Two is proposed to be developed on Portion 2 of the Farm Waterford No. 573, which is located directly adjacent to the southeast. The Naos Solar PV Project Three is proposed to be developed on the Remaining Extent of the Farm Cijfervlei 6 and Portion 1 of the Farm La Reys Kraal Zuid 165, which is located directly adjacent to the west. Refer to Figure 2.1.

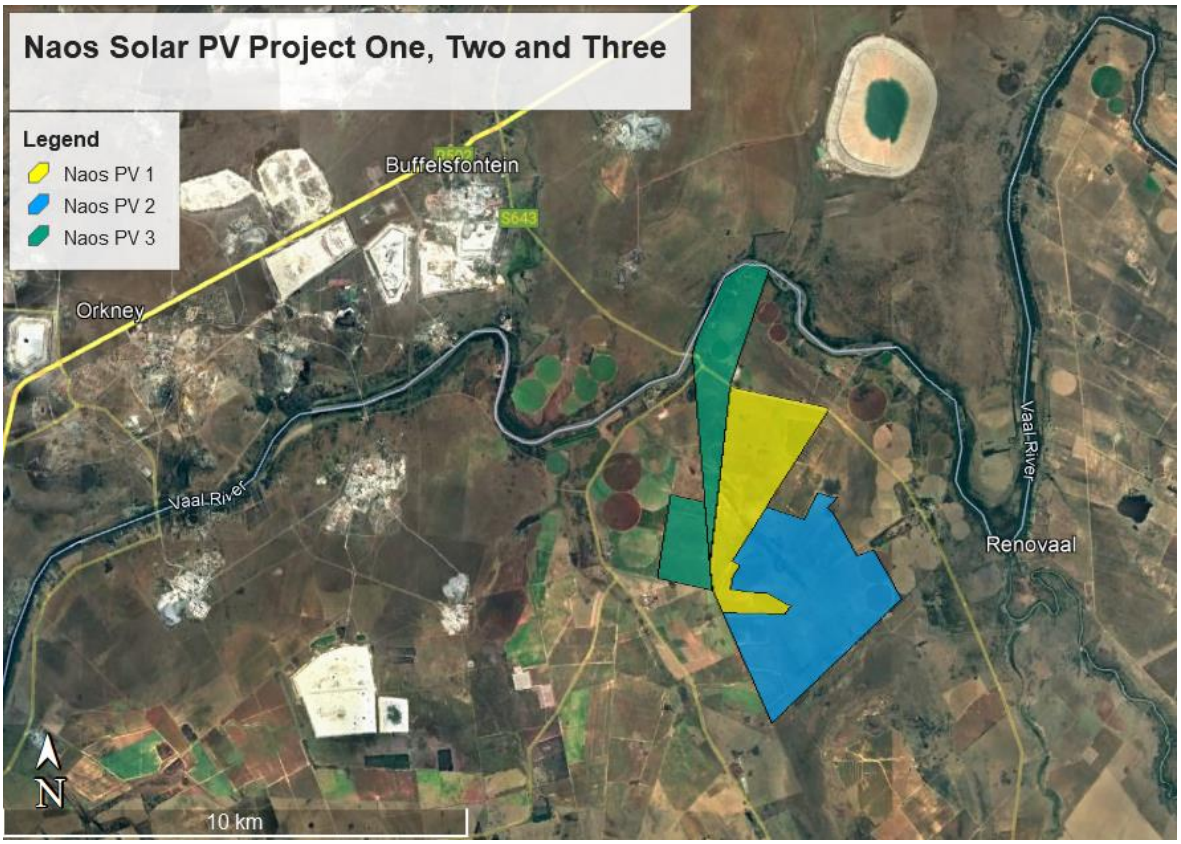


Figure 2.1: Location of Naos Solar PV Project One in relation to Naos Solar PV Project Two and Naos Solar PV Project Three

2.2 ACTIVITY DESCRIPTION

The proposed development will trigger the following activity:

Table 2.2: Listed activities

Relevant notice:	**Activity No (s)**	**Description of each listed activity as per project description**:
GNR. 327 (as amended in 2017)	Activity 11(i)	• *"The development of facilities or infrastructure for the transmission and distribution of electricity (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts."* • Activity 11(i) is triggered as the proposed photovoltaic solar facility will transmit and distribute electricity of 132 kilovolts outside an urban area. The infrastructure for the distribution of electricity will include an on-site facility substation (33kV/132kV), collector substation(33kV/132kV), internal power lines

		(33kV/132kV) and a main overhead power line (33kV/132kV) that will connect the facility directly into the existing 132/400kV Mercury Main Transmission Substation (MTS).
GNR. 327 (as amended in 2017)	Activity 12(ii)(a)(b)	• *"The development of (ii) infrastructure or structures with a physical footprint of 100 square meters or more (a) within a watercourse or (b) within 32 meters of a watercourse, measured from the edge of a watercourse."* • Activity 12(ii)(a)(b) is triggered as an exorheic depression wetland (artificial dam) is located within the site and the development footprint of the Naos Solar PV Project One. This dam will be removed for the placement of the development footprint. Furthermore, two unchanneled valley bottom wetlands are present within all six grid connection corridors under assessment. Some of the power line pylons associated with the line may be located either within 32 meters or within the feature itself and will have a footprint of more than 100 square meters. The service road associated with the power line will also need to cross the watercourse.
GNR. 327 (as amended in 2017)	Activity 14	• *"The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres."* • Activity 14 is triggered since the proposed development will need to develop infrastructure for the storage and handling of dangerous goods (diesel and oils) in containers with combined capacity of 80 cubic metres. The capacity will not exceed 500 cubic metres. The goods are required for construction activities to be undertaken during the construction phase, including the operation of machinery and equipment, as well as

		during the operation phase for the undertaking of routine maintenance activities.
GNR. 327 (as amended in 2017)	Activity 19	• *"The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil sand, shells, shell grit, pebbles or rock of more than 10 cubic meters from a watercourse"* • Activity 19 is triggered as an exorheic depression wetland (artificial dam) is located within the site and the development footprint of the Naos Solar PV Project One. This dam will be removed for the placement of the development footprint. Furthermore, two unchanneled valley bottom wetlands are present within all six grid connection corridors under assessment. Some of the power line pylons associated with the line may be located either within 32 meters or within the feature itself and will have a footprint of more than 100 square meters. The service road associated with the power line will also need to cross the watercourse. Therefore, excavation and removal of soil will be undertaken from the surface water features of up to 4120 cubic meters.
GNR. 327 (as amended in 2017)	Activity 24(ii)	• *"The development of a road (ii) with reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 meters;"* • Activity 24(ii) is triggered as the internal roads will vary between 8 and 12 meters in width. Internal access roads will be up to 12m in width. The main access road providing direct access to the project will be up to 8m wide.
GNR. 327 (as amended in 2017)	Activity 28(ii)	• *"Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 1998 and where such development (ii) will occur outside an urban area,*

		where the total land to be developed is bigger than 1 hectare." • Activity 28(ii) is triggered as portions of the affected property have been used for grazing and crop production and the property will be re-zoned to "special" use for the proposed development. The development footprint of the Naos Solar PV Project One will be up to 550 hectares in extent.
GNR. 327 (as amended in 2017)	Activity 56 (ii):	• *"The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre (ii) where no reserve exists, where the existing road is wider than 8 metres…"* • Activity 56 (ii) is triggered as the existing access to the affected property will need to be widened by more than 6 metres. It is expected that only certain sections of the road will need to be upgraded, where relevant.
GNR. 325 (as amended in 2017)	Activity 1	• *"The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more."* • Activity 1 is triggered since the proposed photovoltaic solar facility will generate up to 300 megawatts electricity through the use of a renewable resource.
GNR. 325 (as amended in 2017)	Activity 15	• *"The clearance of an area of 20 hectares or more of indigenous vegetation."* • In terms of vegetation type the site falls within the Vaal-Vet Sandy Grassland and the Rand Highland Grassland which is described by Mucina and Rutherford (2006) respectively as 'endangered' and 'vulnerable'. Activity 15 is triggered since portions of the site have not been lawfully disturbed during the preceding ten years; therefore, more than 20 hectares of indigenous vegetation will be removed. The development footprint of the solar power plant will be up to 550 hectares.
GNR. 324 (as	Activity 4 (b)(i)(bb)(ee)(gg)	• *"The development of a road wider than 4 metres with a reserve less than 13,5 metres (b) in the Free State, (i) outside urban areas and within (bb) National Protected*

amended in 2017)		*Area Expansion Strategy, (ee) critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans and (gg) areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding disturbed areas."* • Activity 4(b)(i)(bb)(ee)(gg) is triggered as the internal roads will vary between 8 and 12 meters in width. Internal access roads will be up to 12m in width. The main access road providing direct access to the project will be up to 8m wide. The project is located within the Free State Province and falls outside of an urban area. The site is located within a priority focus area of the National Protected Areas Expansion Strategy and a portion of the site and development area is located within a CBA1 as identified in the Free State 2015 Biodiversity Plan. The project is located within 5km of two protected areas in terms of NEMPAA, known as Mispha Game Farm located approximately 1.8km west and the Bushbaby Private Nature Reserve located approximately 1.45 km northeast of the proposed development as per the South Africa Protected Area Database of the Department of Forestry, Fisheries and the Environment.
GNR. 324 (as amended in 2017)	Activity 10 (b)(i)(bb)(ee)(gg)(hh)	• *"The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres (b) in the Free State (i) outside urban areas and within (bb) National Protected Area Expansion Strategy, (ee) Critical Biodiversity Areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans, within (gg) areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding disturbed areas and (hh) Areas within a watercourse or wetland, or*

		within 100 metres from the edge of a watercourse or wetland." • Activity 10(b)(i)(bb)(ee)(gg)(hh) is triggered since the proposed development will need to develop infrastructure for the storage and handling of dangerous goods (diesel and oils) in containers with combined capacity of 80 cubic metres. The capacity will not exceed 500 cubic metres. The goods are required for construction activities to be undertaken during the construction phase, including the operation of machinery and equipment, as well as during the operation phase for the undertaking of routine maintenance activities. The project is located within the Free State Province and falls outside of an urban area. The site is located within a priority focus area of the National Protected Areas Expansion Strategy and a portion of the site and development area is located within a CBA1 as identified in the Free State 2015 Biodiversity Plan. The project is located within 5km of two protected areas in terms of NEMPAA, known as Mispha Game Farm located approximately 1.8km west and the Bushbaby Private Nature Reserve located approximately 1.45 km northeast of the proposed development as per the South Africa Protected Area Database of the Department of Forestry, Fisheries and the Environment. Furthermore, an exorheic depression wetland (artificial dam) is located within the site and the development footprint of the Naos Solar PV Project One. This dam will be removed for the placement of the development footprint. Two unchanneled valley bottom wetlands are also present within all six grid connection corridors under assessment. Some of the power line pylons associated with the line may be located either within 32 meters or within the feature itself. The service road associated with the power line will also need to cross the watercourse.

GNR. 324 (as amended in 2017)	Activity 12 (b)(i)(ii)(iv)	• *"The clearance of an area of 300 square metres or more of indigenous vegetation (b) in the Free State (i) within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004, (ii) within critical biodiversity areas identified in bioregional plans and (iv) areas within a watercourse or wetland; or within 100 metres from the edge of watercourse or wetland.."* • Activity 12(b)(i)(ii)(iv) is triggered since the site is located within the Vaal-Vet Sandy Grassland and the Rand Highland Grassland vegetation types which are described by Mucina and Rutherford (2006) respectively as 'endangered' and 'vulnerable'. The development footprint of the solar power plant will be up to 550 hectares. Furthermore, a portion of the site and development area is located within a CBA1 as identified in the Free State 2015 Biodiversity Plan. An exorheic depression wetland (artificial dam) is located within the site and the development footprint of the Naos Solar PV Project One. This dam will be removed for the placement of the development footprint. Two unchanneled valley bottom wetlands are also present within all six grid connection corridors under assessment. Some of the power line pylons associated with the line may be located either within 32 meters or within the feature itself. The service road associated with the power line will also need to cross the watercourse.
GNR. 324 (as amended in 2017)	Activity 14(ii)(a)(c)(b)(i)(bb)(ff)(hh)	• *"The development of (ii) infrastructure or structures with a physical footprint of 10 square metres or more where such development occurs (a) within a watercourse; or (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; in the (b) Free State Province, (i) outside urban areas, within (bb) National Protected Area Expansion Strategy, (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic*

		biodiversity plans adopted by the competent authority or in bioregional plans and (hh) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve." • Activity 14(ii)(a)(c)(b)(i)(bb)(ff)(hh) is triggered as an exorheic depression wetland (artificial dam) is located within the site and the development footprint of the Naos Solar PV Project One. This dam will be removed for the placement of the development footprint. Furthermore, two unchanneled valley bottom wetlands are present within all six grid connection corridors under assessment. Some of the power line pylons associated with the line may be located either within 32 meters or within the feature itself and will have a footprint of more than 100 square meters. The service road associated with the power line will also need to cross the watercourse. The project is located within the Free State Province and falls outside of an urban area. The site is located within a priority focus area of the National Protected Areas Expansion Strategy and a portion of the site and development area is located within a CBA1 as identified in the Free State 2015 Biodiversity Plan. The project is located within 5km of two protected areas in terms of NEMPAA, known as Mispha Game Farm located approximately 1.8km west and the Bushbaby Private Nature Reserve located approximately 1.45 km northeast of the proposed development as per the South Africa Protected Area Database of the Department of Forestry, Fisheries and the Environment.
GNR. 324 (as amended in 2017)	Activity 18 (b)(i)(bb)(ee)(gg)(hh)	• *"The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre (b) in the Free State (i) outside urban areas, within (bb) National Protected Area Expansion Strategy, (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in*

		bioregional plans, (gg) areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding disturbed areas and (hh) Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland." • Activity 18 (b)(i)(bb)(ee)(gg)(hh) is triggered as the existing access to the affected property will need to be widened by more than 6 metres. It is expected that only certain sections of the road will need to be upgraded, where relevant. The project is located within the Free State Province and falls outside of an urban area. The site is located within a priority focus area of the National Protected Areas Expansion Strategy and a portion of the site and development area is located within a CBA1 as identified in the Free State 2015 Biodiversity Plan. The project is located within 5km of two protected areas in terms of NEMPAA, known as Mispha Game Farm located approximately 1.8km west and the Bushbaby Private Nature Reserve located approximately 1.45 km northeast of the proposed development as per the South Africa Protected Area Database of the Department of Forestry, Fisheries and the Environment. An exorheic depression wetland (artificial dam) is located within the site and the development footprint of the Naos Solar PV Project One. This dam will be removed for the placement of the development footprint. Two unchanneled valley bottom wetlands are also present within all six grid connection corridors under assessment. Some of the power line pylons associated with the line may be located either within 32 meters or within the feature itself. The service road associated with the power line will also need to cross the watercourse.

The potentially most significant impacts will occur during the construction phase of the development, which will include the following activities:

- Site clearing and preparation: Certain areas of the site will need to be cleared of vegetation and access to the site will need to be confirmed.
- Civil works to be conducted:
    - Terrain levelling if necessary– Levelling will be minimal as the potential site chosen is relatively flat.
    - Laying foundation- The structures will be connected to the ground through cement pillars, cement slabs or metal screws. The exact method will depend on the detailed geotechnical analysis.
    - Construction of access roads/paths – existing paths will be used where reasonably possible. Access will be obtained via the existing Vermaasdrift Road, R59, R501 and S643 roads. Additionally, the turning circle for trucks will also be taken into consideration.
    - Trenching – all Direct Current (DC) and Alternating Current (AC) wiring within the PV plant will be buried underground. Trenches will have a river sand base, space for pipes, backfill of sifted soil and soft sand and concrete layering where vehicles will pass.

2.3 PHOTOVOLTAIC TECHNOLOGY

The term photovoltaic describes a solid-state electronic cell that produces direct current electrical energy from the radiant energy of the sun through a process known as the Photovoltaic Effect. This refers to light energy placing electrons into a higher state of energy to create electricity. Each PV cell is made of silicon (i.e. semiconductors), which is positively and negatively charged on either side, with electrical conductors attached to both sides to form a circuit. This circuit captures the released electrons in the form of an electric current (direct current). The key components of the proposed project are described below:

- PV Panel Array - To produce up to 300MW the facility will require numerous linked cells placed behind a protective glass sheet to form a panel. Multiple panels will be required to form the solar PV arrays which will comprise the PV facility.
- Battery Energy Storage System (BESS) – The battery energy storage system will make use of Lithium-ion (Lithium Iron Phosphate / Sodium Sulphur) or Vanadium Redox technology and will have a capacity of up to 4.5GWh. The extent of the system will be ~4.57ha. It must be noted that should the facility layout not require the development and operation of a BESS, the area allocated for the placement of the BESS will be used for panel placement within the development footprint.

- Inverters - Sections of the PV array will be wired to inverters. The inverter is a pulse-width mode inverter that converts direct current (DC) electricity to alternating current (AC) electricity at grid frequency.

- Connection to the grid - Connecting the array to the electrical grid requires the transformation of the voltage from 33kV to 132kV. The normal components and dimensions of a distribution-rated electrical substation will be required. A collector substation with a capacity of 33kV/132kV will also be required.

  The onsite substation will be required on site to step the voltage up to 33kV/132kV, after which the power will be evacuated into the national grid via the new proposed power line from the proposed collector substation to the 132/400kV Mercury Main Transmission Substation (MTS).

  Two collector substation alternative locations are under assessment. Specific internal power lines to connect the collector substation to the main grid connection corridor, which will ultimately evacuate the generated power into the national grid, is also being proposed as part of the required grid connection infrastructure.

  Should the three developments (i.e. Naos Solar PV Project One, Two and Three) all be developed then there would be an overlap of the internal 33kV/132kV power lines that will be shared between the facilities to reduce the extent of linear infrastructure required).

  It must be noted that Collector Substation Option 1 is put forward as the technically preferred option for the project layout.

  The capacity of the collector substation will be 33kV/132kV and the capacity of the internal power lines will be 33kV/132kV.

  Figure 2.2 below provides an indication of the internal grid connection solution for Naos Solar PV Project One.

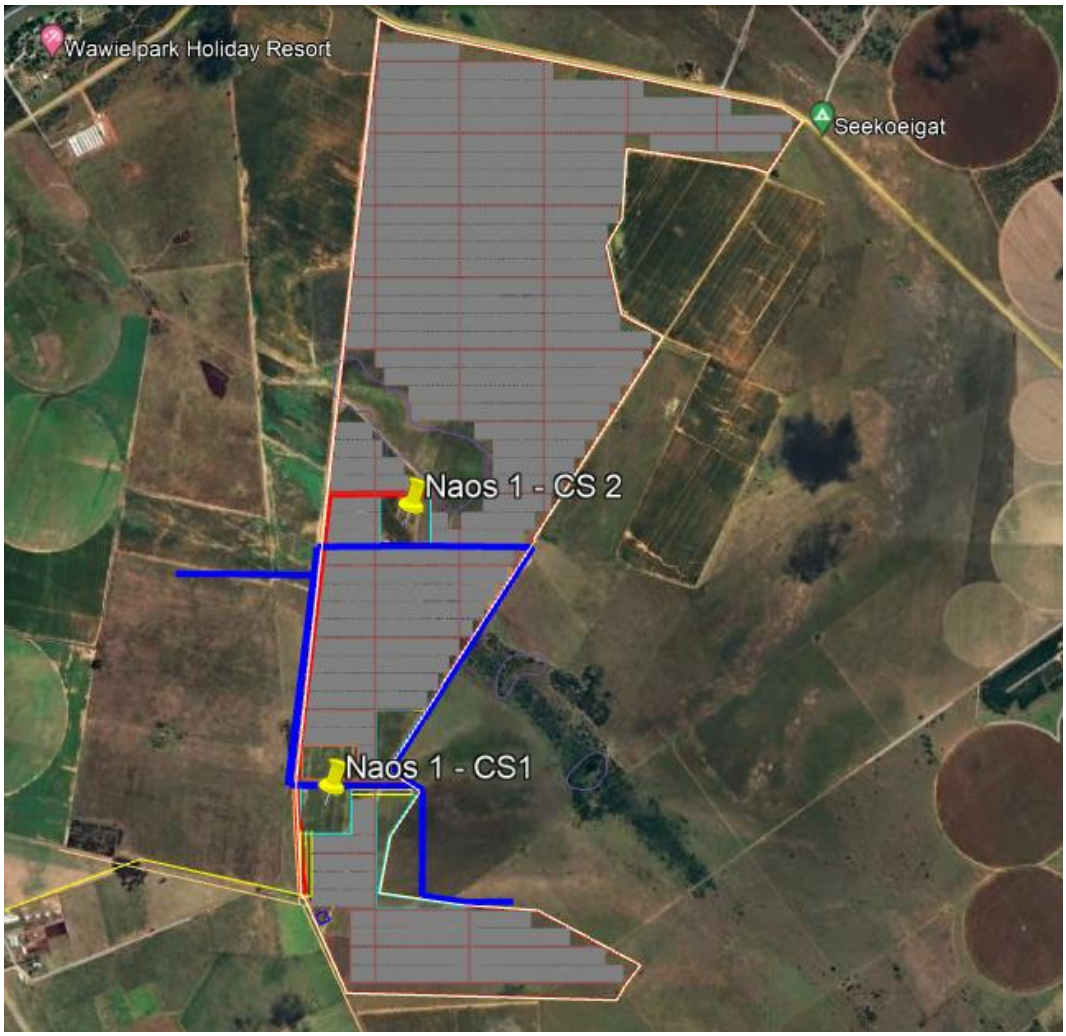


Figure 2.2: : Internal grid connection solution, with two collector substation (CS) alternative locations, for Naos Solar PV Project One (red lines = Naos 1 132kV Eskom power line connecting to the main grid connection corridor for each collector substation alternative, blue lines = Naos 2 & 3 132kV power lines crossing over the Naos Solar PV Project One)

The 132kV power line to connect the facility to the 132/400kV Mercury Main Transmission Substation is under assessment within a 200m wide grid connection corridor. Six alternative routes are being considered. Refer to Figure 2.3.

It must be noted that all six alternatives are also under assessment as part of the respective Basic Assessment processes for the proposed Naos Solar PV Project Two and Naos Solar PV Project Three.

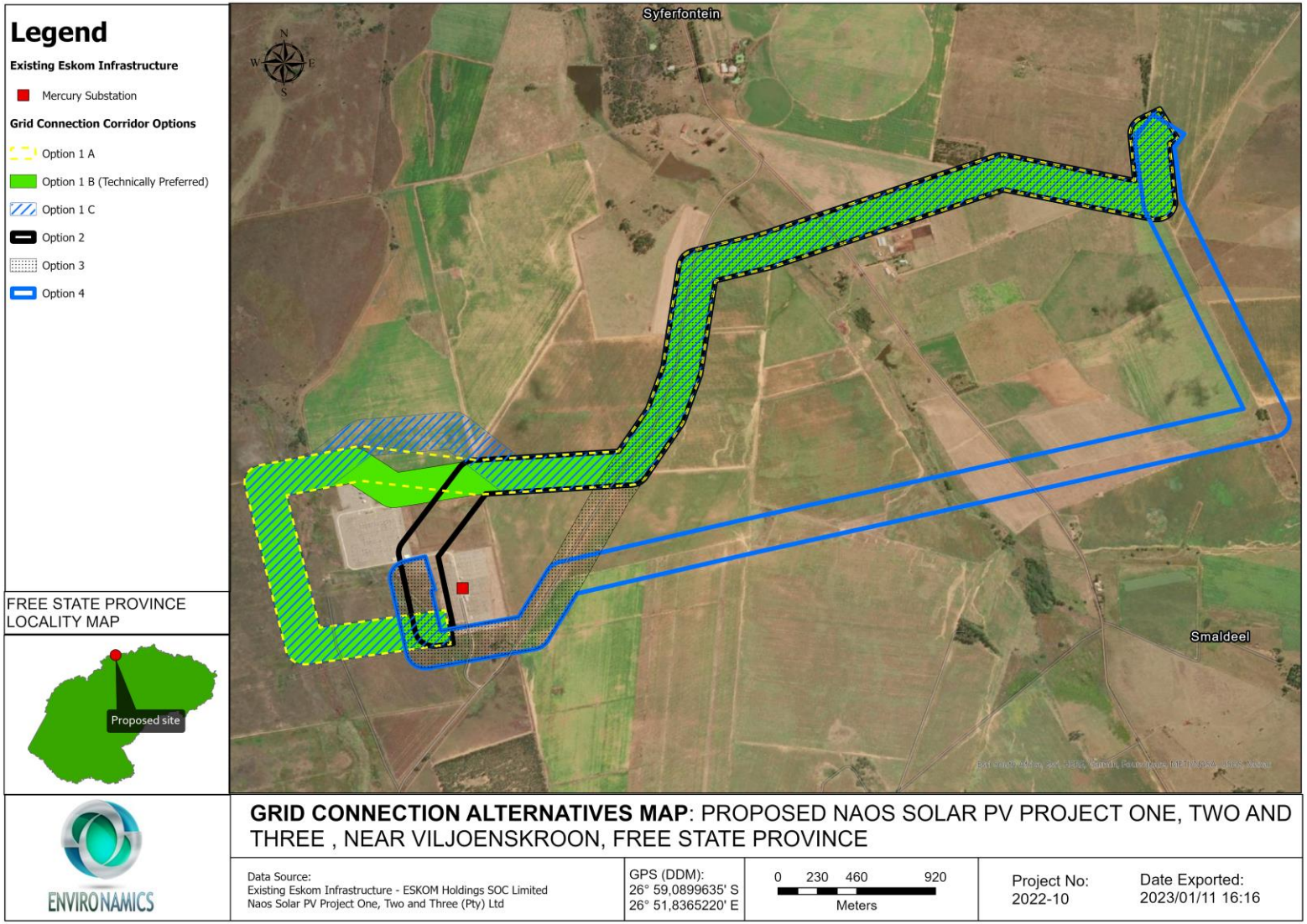


Figure 2.3: Six grid connection corridor alternatives under assessment to connect Naos Solar PV Project One to the existing 132/400kV Mercury Main Transmission Substation

- Electrical reticulation network – An internal electrical reticulation network will be required and will be laid ~2-4 m underground as far as practically possible.

- Supporting Infrastructure – The following auxiliary buildings with basic services including water and electricity will be required on the site:

    - Operations & Maintenance Building / Office (~2510m²);
    - Switch gear and relay room (~800m²);
    - Staff lockers and changing room (~200m²);
    - Security control (~60m²);
    - Permanent Laydown Area (~10ha); and
    - Temporary batching plant

- Roads – Access will be obtained via the existing Vermaasdrift Road, R59, R501 and S643 roads. Four alternative main access routes are being considered (the preferred route will be determined by the local and / or national roads authorities during the site access permit approval process). An internal site road network will also be required to provide access to each respective solar field and associated infrastructure. Internal access roads will be up to 12m in width. The main access road providing direct access to the project will be up to 8m wide and 6km long.

- Fencing - For health, safety and security reasons, the facility will be required to be fenced off from the surrounding farms. The project will have permanent security on site for 24hrs per day, 7 days a week.

2.4 LAYOUT DESCRIPTION

The layout plan will consider and adhere to the limitations of the site and aspects such as environmentally sensitive areas, roads, fencing and servitudes on site. The total surface area covered by the layout include the PV panel arrays (spaced to avoid shadowing), access and maintenance roads and associated infrastructure (buildings, power inverters, power lines, onsite substation and collector substation, BESS and perimeter fences). Limited environmental features of significance exist on site. A final layout plan is included in Appendix H under Layout Plans in the report, as well as Figures H and I. Table 2.2 below provides detailed information regarding the layout for the proposed facility as per DFFE requirements.

Table 2.2: Technical details for the proposed facility

Component	Description / dimensions
Height of PV panels	Up to 3 meters
Area of PV Array	Naos Solar PV Project One: up to 550 ha (Development Footprint)
Number of inverters required	Number of String inverters: up to 1500 Number of Central inverters: up to 90 These are indicative numbers and are subject to change as part of the final facility layout design.
Area occupied by inverter / transformer stations / substations	String inverters (per item): 1 m^2 Central Inverters (per item): 20 m^2 Transformers (per item): 20 m^2 (included in the on-site substation) On-site Facility Substation: up to 2000 m^2 Collector Substation: up to 25000 m^2 BESS: ~4.57ha
Capacity of the on-site substation	33kV / 132kV
Capacity of the collector substation	33kV / 132kV
Capacity of the power lines	33kV / 132kV
Area occupied by both permanent and construction laydown areas	~10ha
Area occupied by buildings	• Operations & Maintenance Building / Office (~2510m²); • Switch gear and relay room (~800m²); • Staff lockers and changing room (~200m²); • Security control (~60m²);
Length of internal roads	up to 24km
Width of internal roads	up to 12m
Length of internal power lines to connect the collector substations	Naos Solar PV Project One: up to 4km
Grid connection corridor width	200m
Grid connection corridor length – for main power line connecting to the Mercury MTS	Power Line Alternative 1A – up to 8km Power Line Alternative 1B (technically preferred) – up to 8km Power Line Alternative 1C – up to 8km Power Line Alternative 2 – up to 7km Power Line Alternative 3 – up to 7km Power Line Alternative 4 – up to 7.5km
Power line servitude width	Up to 32m
Height of fencing	Approximately 3 meters

Table 2.4 provides the coordinate points for the proposed project site, associated infrastructure and grid connection corridor alternatives.

Table 2.4: Coordinates

Coordinates			
Project Site (development footprint of 550ha)	A	26°56'49.93"S	26°52'51.87"E
	B	26°56'33.95"S	26°51'36.09"E
	C	26°58'29.04"S	26°52'6.21"E
	D	26°58'54.17"S	26°51'22.03"E
	E	26°59'10.62"S	26°52'18.61"E
	F	26°59'5.23"S	26°52'22.73"E
	G	26°58'56.33"S	26°52'4.39"E
	H	26°58'53.54"S	26°51'35.90"E
	I	26°58'37.38"S	26°51'43.17"E
	J	26°58'33.95"S	26°51'37.57"E
	K	26°57'24.48"S	26°52'26.79"E
	L	26°57'9.97"S	26°52'16.67"E
	M	26°56'54.37"S	26°52'20.33"E
On-site Substation	A	26°58'35.90"S	26°51'21.96"E
	B	26°58'43.98"S	26°51'21.96"E
	C	26°58'43.99"S	26°51'30.98"E
	D	26°58'35.90"S	26°51'31.00"E
Battery Energy Storage System	A	26°58'29.95"S	26°51'22.23"E
	B	26°58'30.01"S	26°51'32.18"E
	C	26°58'35.30"S	26°51'32.19"E
	D	26°58'35.29"S	26°51'22.22"E
	A	26°58'35.90"S	26°51'21.96"E
	B	26°58'43.98"S	26°51'21.96"E

Collector Substation Option 1 (technically preferred)	C	26°58'43.99"S	26°51'30.98"E
	D	26°58'35.90"S	26°51'31.00"E
Collector Substation Option 2	A	26°57'49.97"S	26°51'36.19"E
	B	26°57'58.06"S	26°51'36.17"E
	C	26°57'58.05"S	26°51'45.22"E
	D	26°57'49.95"S	26°51'45.21"E
Connection Option 1B (technically preferred)			
Power Line Corridor – Option 1B	A	26°58'39.14"S	26°51'24.69"E
	B	26°58'40.88"S	26°51'20.98"E
	C	26°58'53.82"S	26°51'22.24"E
	D	26°58'48.11"S	26°50'53.14"E
	E	26°59'6.14"S	26°49'55.78"E
	F	26°59'34.14"S	26°49'49.60"E
	G	26°59'44.01"S	26°49'42.78"E
	H	26°59'48.26"S	26°48'58.23"E
	I	26°59'43.50"S	26°48'50.79"E
	J	26°59'46.85"S	26°48'33.77"E
	K	27° 0'17.91"S	26°48'41.47"E
	L	27° 0'14.16"S	26°49'8.50"E
		27° 0'14.13"S	26°49'8.16"E

2.5 SERVICES PROVISION

The following sections provide information on services required on the site e.g. water, sewage, refuse removal, and electricity.

2.5.1 Water

Adequate provision of water will be a prerequisite for the development. Water for the proposed development will most likely be obtained from the local municipality, or alternatively from ground water resources. The Department of Water and Sanitation will be requested by the Applicant to

confirm the water resource availability in the relevant catchment management area in order to ensure sustainable water supply. A full assessment of the application for water use authorisation will only be undertaken in the event that the project proponent has obtained preferred bidder status by the Department of Mineral Resources and Energy for the development of the project or is successful as part of any other generation programme.

The estimated maximum amount of water required during construction is ~70000 kilolitres per year (during a construction period of up to 18 months). During operation of the facility ~4000 kilolitres per year for up to 30-year period will be required. The majority of this usage is for the cleaning of the solar panels during the operation phase, as well as sanitary use, sewage and drinking water. It is estimated that the panels may only need to be washed twice per annum, but provision is made for quaternary cleaning (March, May, July, and September).

Drinking water supplied will comply with the SANS:241 quality requirements and it is noted that the Moqhaka Local Municipality remains the Water Service Authority in the area.

Water saving devices and technologies such as the use of dual flush toilets and low-flow taps, the management of stormwater, the capture and use of rainwater from gutters and roofs would be considered by the developer. Furthermore, indigenous vegetation will be used during landscaping and the staff will be trained to implement good housekeeping techniques, including the appropriate usage of water.

2.5.2 Storm water

To avoid soil erosion, it is recommended that the clearing of vegetation be limited. Stormwater management and mitigation measures are included in the Environmental Management Programme (EMPr) – refer to Appendix F.

2.5.3 Sanitation and waste removal

Portable chemical toilets will be utilised, that will be serviced privately or by the local municipality. Waste will be disposed of at a licensed landfill site. The construction- and hazardous waste will be removed and disposed of at licensed landfill sites accepting such kinds of wastes. During the operation phase household waste will be removed to a licensed landfill site by a private contractor or by the local municipality. The relevant Local Municipality(s) will be contacted to formally confirm that it has the capacity to provide the proposed development with these services for the lifetime of the project (30 years).

2.5.4 Electricity

During the construction phase of the development electricity will either be generated on site through a small solar system or through the use of generators or the existing Eskom supply on the affected property will be utilised. This will depend on the Engineering, Procurement, and Construction (EPC) contractor appointed. During operation electricity use will be limited and will primarily be related to the lighting of the facility and domestic use. Design measures such as the

use of energy saving light bulbs will be considered by the developer. During the day, electricity will be sourced from the photovoltaic plant, and from the electricity connection at night.

2.6 DECOMMISSIONING OF THE FACILITY

The operating period will be 30 years from the commencement date of the operation phase. Thereafter two rights of renewal periods of 40 years and 30 years will be relevant. It is anticipated that new PV technologies and equipment will be implemented, within the scope of the Environmental Authorisation, when influencing the profitability of the solar facility.

A likely extension of the plant's lifetime would involve putting new, more efficient, solar panels on the existing structures to improve the efficiency of the facility as the technology improves. The specifications of these new panels will be the same as the current panels under consideration, but the conversion efficiency of sunlight to energy will be greater (comparable to new computer chips, that are the same, but faster and more efficient). If, for whatever reason the plant halts operations, the Environmental Authorisation and contract with the landowner will be respected during the decommissioning phase.

The decommissioning process will consist of the following steps:

- The PV facility would be disconnected from the Eskom grid.
- The inverters and PV modules would be disconnected and disassembled.
- Concrete foundations (if used) would be removed and the structures would be dismantled.
- Wastewater storage conservancy tanks would be responsibly removed and the area would be rehabilitated.
- The underground cables would be unearthed and removed and buildings would be demolished and removed.
- The fencing would be dismantled and removed.
- The roads can be retained should the landowner choose to retain them, alternatively the roads will be removed and the compaction will be reversed.
- Most of the wires, steel and PV modules are recyclable and would be recycled to a reasonable extent. The Silicon and Aluminium in PV modules can be removed and reused in the production of new modules.
- Any rubble and non-recyclable materials will be disposed of at a registered landfill facility.

The rehabilitation of the site would form part of the decommissioning phase. The aim would be to restore the land to its original form (or as close as possible). The rehabilitation activities would include the following:

- Removal of all structures and rubble;

- Breaking up compaction where required, loosening of the soil and the redistribution of topsoil; and
- Restoration of the surface to the original contours and application of hydro seeding.

3 LEGISLATIVE AND POLICY CONTEXT

This section aims to address the following requirements of the regulations:

Appendix 1. (3) A BAR (...) must include-

(e) a description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context.

3.1 INTRODUCTION

Environmental decision making with regards to solar PV plants and associated infrastructure is based on numerous policy and legislative documents. These documents inform decisions on project level environmental authorisations issued by the National Department of Forestry, Fisheries and the Environment (DFFE) as well as comments from local and district authorities. Moreover, it is significant to note that they also inform strategic decision making reflected in IDPs and SDFs. Therefore, to ensure streamlining of environmental authorisations it is imperative for the proposed activity to align with the principles and objectives of key national, provincial and local development policies and legislation. The following acts and policies and their applicability to the proposed development are briefly summarised:

- The Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996)
- National Environmental Management Act, 1998 (Act No. 107 of 1998) [NEMA]
- The National Energy Act, 2008 (Act 34 of 2008)
- Electricity Regulation Act (Act No. 4 of 2006) (as amended)
- National Water Act, 1998 (Act No. 36 of 1998)
- National Environmental Management: Biodiversity Act (10 of 2004) (NEMBA)
- National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)
- National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)
- The National Heritage Resources Act, 1999 (Act No. 25 of 1999)
- Conservation of Agricultural Resources Act, 1983 (Act No. 85 of 1983)
- Subdivision of Agricultural Land Act (70 of 1970) (SALA)
- Spatial Planning and Land Use Management Act, 2013 (Act 16 of 2013) (SPLUMA)
- The National Forests Act, 1998 (Act 84 of 1998)
- The National Road Traffic Act (93 of 1996) (NRTA)

- The White Paper on the Energy Policy of the Republic of South Africa (1998)
- The White Paper on Renewable Energy (2003)
- Integrated Resource Plan (IRP) for South Africa (2010-2030)
- National Development Plan of 2030
- National Infrastructure Plan of South Africa (2012)
- New Growth Path Framework (2010)
- Climate Change Bill (2018)
- Climate Change Bill (2021) – for public comment
- Strategic Integrated Projects (SIPs) (2010 – 2030)
- Strategic Environmental Assessment (SEA) for wind and solar PV Energy in South Africa (2014)
- Free state Provincial Spatial Development Framework (PSDF) (2012)
- Fezile Dabi District Municipality Final Integrated Development Plan (IDP) 2022-2027
- Moqhaka Local Municipality Final Integrated Development Plan(IDP) 2022-2027

The key principles and objectives of each of the legislative and policy documents are briefly summarised in Tables 3.1 and 3.2 to provide a reference framework for the implications for the proposed activity.

3.2 LEGISLATIVE CONTEXT

Table 3.1: Legislative context for the construction of photovoltaic solar plants

LEGISLATION	ADMINISTERING AUTHORITY	DATE	SUMMARY / IMPLICATIONS FOR PROPOSED DEVELOPMENT
The Constitution of South Africa **(Act No. 108 of 1996)**	National Government	1996	The Constitution is the supreme law of the Republic and all law and conduct must be consistent with the Constitution. The Chapter on the Bill of Rights contains a number of provisions, which are relevant to securing the protection of the environment. Section 24 states that "everyone has the right to (a) an environment that is not harmful to their health or well-being and (b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that – (i) prevent pollution and ecological degradation; (ii) promote conservation; and (iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development. The Constitution therefore, compels the government to give effect to the people's environmental rights and places the government under a legal duty to act as a responsible custodian of the country's environment. It compels the government to pass legislation and use other measures to protect the environment, to prevent pollution and ecological degradation, promote conservation and secure sustainable development. The development of the Naos Solar PV Project One and the aspects related thereto considers the creation of an environment which is not harmful or degraded through the implementation of appropriate mitigation measures.
The National Environmental Management Act **(Act No. 107 of 1998)**	National Department of Environmental Affairs (now known as the Department of Forestry, Fisheries and the Environment) and	1998	NEMA provides for co-operative governance by establishing principles and procedures for decision-makers on matters affecting the environment. An important function of the Act is to serve as an enabling Act for the promulgation of legislation to effectively address integrated environmental management. Some of the principles in the Act are accountability; affordability; cradle to grave management; equity; integration; open information; polluter pays; subsidiary; waste avoidance and minimisation; co-operative governance; sustainable development; and environmental protection and justice.

	the Free State Province Department of Economic, Small Business Development, Tourism and Environmental Affairs (DESTEA)		The mandate for EIA lays with the National Environmental Management Act (107 of 1998) and the EIA Regulations No. 324, 325, 326, and 327 promulgated in terms of Section 24 of NEMA. The EIA Regulations determine that an Environmental Authorisation is required for certain listed activities, which might have a detrimental effect on the environment. The BA process undertaken for the Naos Solar PV Project One is in-line with the requirements of NEMA for the Application for Environmental Authorisation.
The National Energy Act (Act No. 34 of 2008)	Department of Mineral Resources and Energy	2008	One of the objectives of the National Energy Act was to promote diversity of supply of energy and its sources. In this regard, the preamble makes direct reference to renewable resources, including solar: "To ensure that diverse energy resources are available, in sustainable quantities, and at affordable prices, to the South African economy, in support of economic growth and poverty alleviation, taking into account environmental management requirements (…); to provide for (…) increased generation and consumption of renewable energies…" (Preamble). Considering that the Naos Solar PV Project One is proposed to make use of PV technology and the solar resource for the generation of electricity, the proposed project is in-line with the Act.
Electricity Regulation Act (Act No. 4 of 2006) (as amended)	National Energy Regulator of South Africa (NERSA)	2006	The Act provides a national regulatory framework for the electricity supply industry. The Act requires registration and licensing of anyone wanting to generate, transmit, reticulate, distribute, trade, or import and export electricity. One of the requirements for the REIPPPP is for the Proponent to hold an environmental authorisation for the proposed project. The REIPPPP is guided by the National Energy Act, one of the purposes of which is to promote sustainable development of renewable energy infrastructure.
The National Water Act (Act No. 36 of 1998)	Department of Water Affairs (now known as Department of	1998	Sustainability and equity are identified as central guiding principles in the protection, use, development, conservation, management and control of water resources. The intention of the Act is to promote the equitable access to water and the sustainable use of water, redress past racial and gender discrimination, and facilitate economic and social development. The Act provides the rights of access to basic water supply and sanitation, and environmentally, it

	Water and Sanitation)		provides for the protection of aquatic and associated ecosystems, the reduction and prevention of pollution and degradation of water resources. As this Act is founded on the principle that National Government has overall responsibility for and authority over water resource management, including the equitable allocation and beneficial use of water in the public interest, a person can only be entitled to use water if the use is permissible under the Act. Chapter 4 of the Act lays the basis for regulating water use. The Wetland Impact Assessment (Appendix D8) confirms that the area slopes gently towards the Vaal River in the North. Drainage occurs towards the North, into the Vaal River. The site is located within the C24B quaternary catchment and is situated in the Middle Vaal Water Management Area. An exorheic depression wetland (artificial dam) is located within the site and the development footprint of the Naos Solar PV Project One. This dam will be removed for the placement of the development footprint. Furthermore, two unchanneled valley bottom wetlands are present within all six grid connection corridors under assessment. The power line pylons associated with the line will be located either within 32 meters or within the feature. The service road associated with the power line will also need to cross the watercourse. The National Water Act will be applicable in terms of obtaining the relevant license for the water uses triggered.
National Environmental Management: Biodiversity Act (10 of 2004) (NEMBA)	Department of Forestry, Fisheries and the Environment (DFFE)	2004	"The Act calls for the management of all biodiversity within South Africa. The 2007 Threatened or Protected Species Regulations (GN R150, as amended) provides protection through a permit system as well as through the identification of restricted activities. If required, the relevant permits will be applied for." The Act also provides for duty of care with regards to control of alien species.
National Environmental	National Department Environmental Affairs (DEA) (now	2008	NEMWA has been developed as part of the law reform process enacted through the White Paper on Integrated Pollution and Waste Management and the National Waste Management Strategy (NWMS). The objectives of the Act relate to the provision of measures to protect

Management: Waste Act **(Act No. 59 of 2008)**	known as the Department of Forestry, Fisheries and the Environment)		health, well-being and the environment, to ensure that people are aware of the impact of waste on their health, well-being and the environment, to provide for compliance with the measures, and to give effect to section 24 of the Constitution in order to secure an environment that is not harmful to health and well-being. Regulations No. R921 (of 2013) promulgated in terms of Section 19(1) of the National Environmental Management: Waste Act (59 of 2008) determines that no person may commence, undertake or conduct a waste management activity listed in this schedule unless a license is issued in respect of that activity. It is not envisaged that a waste permit will be required for the proposed development as no listed activities in terms of waste management are expected to be triggered. .
National Environment Management: Air Quality Act **(Act No. 39 of 2004)**	National Department Environmental Affairs (DEA) (now known as the Department of Forestry, Fisheries and the Environment)	2004	The objective of this Act is to protect the environment by providing reasonable measures for the protection and enhancement of the quality of air in the Republic; the prevention of air pollution and ecological degradation; and securing ecologically sustainable development while promoting justifiable economic and social development. Regulations No. R248 (of 31 March 2010) promulgated in terms of Section 21(1)(a) of the National Environmental Management Act: Air Quality Act (39 of 2004) determine that an Atmospheric Emission License (AEL) is required for certain listed activities, which result in atmospheric emissions which have or may have a detrimental effect on the environment. The Regulation also sets out the minimum emission standards for the listed activities. It is not envisaged that an Atmospheric Emission License will be required for the proposed development.
The National Heritage Resources Act **(Act No. 25 of 1999)**	South African Heritage Resources Agency (SAHRA)	1999	The Act aims to introduce an integrated and interactive system for the management of heritage resources, to promote good governance at all levels, and empower civil society to nurture and conserve heritage resources so that they may be bequeathed to future generations and to lay down principles for governing heritage resources management throughout the Republic. It also aims to establish the South African Heritage Resources Agency together with its Council to co-ordinate and promote the management of heritage resources, to set norms and maintain essential national standards and to protect heritage resources, to provide for the protection

			and management of conservation-worthy places and areas by local authorities, and to provide for matters connected therewith. The Act protects and manages certain categories of heritage resources in South Africa. For the purposes of the Heritage Resources Act, a "heritage resource" includes any place or object of cultural significance. In this regard the Act makes provision for a person undertaking an activity listed in Section 28 of the Act to notify the resources authority. The resources authority may request that a heritage impact assessment be conducted if there is reason to believe that heritage resources will be affected. A case file has been opened on the SAHRIS (CaseID: 19420) for the Naos Solar PV Project One and all relevant documents have been submitted. The Heritage Impact Assessment undertaken for the development is included as Appendix D5 and the Paleontological Impact Assessment report is included as Appendix D6 to this draft BAR.
Conservation of Agricultural Resources Act (Act No. 85 of 1983)	National and Provincial Government	1983	The objective of the Act is to provide control over the utilisation of the natural agricultural resources of the Republic in order to promote the conservation of the soil, the water sources and the vegetation and the combating of weeds and invader plants; and for matters connected therewith. Consent will be required from the Department of Rural Development and Land Reform in order to confirm that the proposed development is not located on high potential agricultural land and to approve the long -term lease agreement. A Soil and Agricultural Impact Assessment has been undertaken for the Naos Solar PV Project One and is included as Appendix D4 of this draft BAR.
Subdivision of Agricultural Land Act (70 of 1970) (SALA)	Department of Agriculture, Land Reform and Rural Development (DALRRD)	1970	The purpose of this Act is to control the subdivision of agricultural land and, in connection therewith, the use of agricultural land. Applications are lodged with the Department of Agriculture, Land Reform and Rural Development (DALRRD) to allow for the subdivision of agricultural land, as well as other prohibited actions in terms of the Act. In order to limit the potential threat that solar energy development could pose to agricultural production and to the agricultural economy, DALRRD created the 10% rule to inform the decision of whether a solar

			energy development on agricultural land should be approved or not. This rule states that a solar energy facility may not utilise more than 10% of the surface area of a farm. Its aim was to ensure that each farm unit remained predominantly agricultural rather than certain farms abandoning agricultural production in favour of renewable energy generation. The current agricultural activities and economic value considering the climatic challenges experienced in the area has been considered in the Agricultural Economic Assessment (Appendix D9).
Spatial Planning and Land Use Management Act, 2013 (Act 16 of 2013) (SPLUMA);	Provincial Authority	2013	This suite of legislation provides the framework for spatial planning and regulates the use and development of land.
The National Forests Act, 1998 (Act 84 of 1998)	Department of Environmental Affairs (now known as the Department of Forestry, Fisheries and the Environment)	1998	The purposes of this Act are to: (a) promote the sustainable management and development of forests for the benefit of all; (b) create the conditions necessary to restructure forestry in State forests; (c) provide special measures for the protection of certain forests and trees: (d) promote the sustainable use of forests for environmental, economic, educational, recreational, cultural, health and spiritual purposes. (e) promote community forestry; (f) promote greater participation in all aspects of forestry and the forest products industry by persons disadvantaged by unfair discrimination. Section 12(1) read with s15(1) of the NFA stated that the Minister may declare a particular tree, group of trees, woodland; or trees belonging to a particular species, to be a protected tree, group of trees, woodland or species. A list of protected tree species was gazetted in GN 635 of 6 December 2019. The effect of the declaration is that no person may (a) cut, disturb, damage

			or destroy; or (b) possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, or any forest product derived from a protected tree, except under a license granted by the Minister; or in terms of an exemption published by the Minister in the Gazette. A Terrestrial Biodiversity Impact Assessment has been undertaken for the Naos Solar PV Project One and is included in Appendix D1 of this draft BAR.
National Road Traffic Act (93 of 1996) (NRTA)	Department Roads and Public Works	1996	Certain vehicles and loads cannot be moved on public roads without exceeding the limitations in terms of the dimensions and/or mass as prescribed in the Regulations of the NRTA. Due to the large size of some of the facility's components, they will need to be transported via "abnormal loads". Access to the site is readily available via the existing Vermaasdrift Road, R59, R501 and S643 roads. Some roads have been identified for upgrade to ensure that the heavy vehicles can reach the site.
Free State Nature Conservation Ordinance, 1969 (Act 8 of 1969)	Free State Province Department of Economic, Small Business Development, Tourism and Environmental Affairs (DESTEA)	1969	The Act provides for the conservation of fauna and flora and the hunting of animals causing damage and for matters incidental thereto. This includes wild animals, fish, indigenous plants, as well as nature reserves. The Act also provides for the permitting of the disturbance of such species. A Terrestrial Biodiversity Impact Assessment has been undertaken for the Naos Solar PV Project One and is included in Appendix D1 of this draft BAR.

3.3 POLICY CONTEXT

Table 3.2: Policy context for the construction of solar PV plants

POLICY	ADMINISTERING AUTHORITY	DATE	SUMMARY / IMPLICATIONS FOR PROPOSED DEVELOPMENT
The White Paper on the Energy Policy of the Republic of South Africa	Department of Mineral Resources and Energy	1998	The White Paper on the Energy Policy of the Republic of South Africa establishes the international and national policy context for the energy sector, and identifies the following energy policy objectives: • Increasing access to affordable energy services • Improving energy governance • Stimulating economic development • Managing energy-related environmental and health impacts • Securing supply through diversity • Energy policy priorities The White Paper sets out the advantages of renewable energy and states that the Government believes that renewables can in many cases provide the least cost energy service, particularly when social and environmental costs are included. The White Paper acknowledges that South Africa has neglected the development and implementation of renewable energy applications, despite the fact that the country's renewable energy resource base is extensive, and many appropriate applications exist. The White Paper notes that renewable energy applications have specific characteristics that need to be considered. Advantages include: • Minimal environmental impacts in operation in comparison with traditional supply technologies; and • Generally lower running costs, and high labour intensities.

			Disadvantages include: • Higher capital costs in some cases; • Lower energy densities; and • Lower levels of availability, depending on specific conditions, especially with sun and wind based systems. Naos Solar PV Project One is in line with this policy as it proposes the generation of renewable energy from the solar resource.
The White Paper on Renewable Energy	Department of Mineral Resources and Energy	2003	This White Paper on Renewable Energy supplements the *White Paper on Energy Policy*, which recognises that the medium and long-term potential of renewable energy is significant. This Paper sets out Government's vision, policy principles, strategic goals and objectives for promoting and implementing renewable energy in South Africa. The White Paper notes that while South Africa is well-endowed with renewable energy resources that have the potential to become sustainable alternatives to fossil fuels, these have thus far remained largely untapped. Government's long-term goal is the establishment of a renewable energy industry producing modern energy carriers that will offer in future years a sustainable, fully non-subsidised alternative to fossil fuels. The medium-term (10-year) target set in the White Paper is: *10 000 GWh (0.8 Mtoe) renewable energy contribution to final energy consumption by 2013, to be produced mainly from biomass, wind, solar and small-scale hydro. The renewable energy is to be utilised for power generation and non-electric technologies such as solar water heating and bio-fuels. This is approximately 4% (1667 MW) of the projected electricity demand for 2013 (41539 MW)* (Executive Summary, ix). Naos Solar PV Project One is in line with this policy as it proposes the generation of renewable energy from the solar resource.
Integrated Resource Plan	Department of Mineral	2010-2030	The Integrated Resource Plan for Electricity for South Africa of 2010–2030 (further referred to as the IRP) is a "living plan" which is expected to be revised and updated continuously as necessary due to changing circumstances. According to the Summary of the plan the current IRP for South Africa, which was originally

(IRP) for South Africa	Resources and Energy	initiated by the Department of Energy (DoE) in June 2010 (the Department is now known as Department of Mineral Resources and Energy), led to the Revised Balanced Scenarios (RBS) for the period 2010–2030. "*This scenario was derived based on the cost-optimal solution for new build options (considering the direct costs of new build power plants), which was then "balanced" in accordance with qualitative measures such as local job creation".* In addition to all existing and committed power plants, the RBS included 11,4 GW of renewables, which relates to the proposed Naos Solar PV Project One. In 2010 several changes were made to the IRP model. The main changes in the IRP were the disaggregation of renewable energy technologies to explicitly display solar photovoltaic (PV), concentrated solar power (CSP), and wind options (RSA, 2011a). The summary of the IRP further explains that traditional cost-optimal scenarios were developed based on the previously mentioned changes in the IRP. This resulted in the Policy-Adjusted IRP, which stated that: "*The installation of renewables (solar PV, CSP and wind) have been brought forward in order to accelerate a local industry*; *To account for the uncertainties associated with the costs of renewables and fuels, a nuclear fleet of 9,6 GW is included in the IRP; The emission constraint of the RBS (275 million tons of carbon dioxide per year after 2024) is maintained; and Energy efficiency demand-side management (EEDSM) measures are maintained at the level of the RBS*" (RSA, 2011a:6). *"The Policy-Adjusted IRP includes the same amount of coal and nuclear new builds as the RBS, while reflecting recent developments with respect to prices for renewables. In addition to all existing and committed power plants (including 10 GW committed coal), the plan includes 9,6 GW of nuclear; 6,3 GW of coal; 17,8 GW of renewables; and 8,9 GW of other generation sources"* (RSA, 2011a:6). The IRP highlights the commitments before the next IRP. The commitments pertaining to the purpose of the proposed project in renewable energy is: "*Solar PV programme 2012-2015: In order to facilitate the connection of the first solar PV units to the grid in 2012 a firm commitment to this capacity is necessary. Furthermore, to provide the security of investment to ramp up a sustainable local industry cluster, the first four years from 2012 to 2015 require firm commitment."* "*Solar PV 2016 to 2019: As with wind, grid upgrades might become necessary for the second round of solar PV installations from 2016 to 2019, depending on their location. To trigger the associated tasks in a timely*

manner, a firm commitment to these capacities is necessary in the next round of the IRP at the latest. By then, the assumed cost decreases for solar PV will be confirmed" (IRP, 2011a:17).

In conclusion the IRP recommends that an accelerated roll-out in renewable energy options should be allowed with regards to the benefits of the localization in renewable energy technologies (RSA, 2011a). It is however important to take note that since the release of the IRP in 2011 there has been a number of developments in the energy sector of South Africa. Therefore, the IRP has been updated and were open for comments until March of 2017. The new IRP of 2019 was formally published in October 2019. The draft IRP of 2018 was open for comments until the end of October 2018. For the revision scenario analysis were conducted and the results thereof are included in the draft IRP of 2018. The results revealed that for the period ending 2030 that: *"The committed Renewable Energy Independent Power Producers Programme, including the 27 signed projects and Eskom capacity rollout ending with the last unit of Kusile in 2022, will provide more than sufficient capacity to cover the projected demand and decommissioning of plants up to approximately 2025"; "Imposing annual build limits on renewable energy will not affect the total cumulative capacity and the energy mix for the period up to 2030*"; and *"the scenario without renewable energy annual build limits provides the least-cost option by 2030*" (RSA, 2018:34).

Lastly, the draft IRP of 2018 also included the scenario analysis for the period post 2030. Here it was observed that: "*Imposing annual build limits on renewable energy will restrict the cumulative renewable installed capacity and the energy mix for this period; adopting no annual build limits on renewables or imposing a more stringent strategy to reduce greenhouse gas emissions implies that no new coal power plants will be built in the future unless affordable cleaner forms of coal-to-power are available; and the scenario without renewable energy annual build limits provides the least-cost option by 2050*" (RSA, 2018:34–35).

In the final IRP of 2019 key considerations were taken into consideration together with required actions to be taken for the IRP of 2019 to be credible. In terms of renewable energy technologies like solar and wind, the IRP stated that *"The application of renewable build limits 'smoothes out' the capacity allocations for wind and solar PV which provides a constant pipeline of projects to investment; this addresses investor confidence*". The decision stated against this key consideration is to *"retain the current annual build limits on renewables (wind and PV) pending the finalization of a just transition plan"* (RSA, 2019:46). Hereby the

			IRP also recognises renewable technologies' potential to diversify the electricity mix, create new industries and job opportunities and localize across the value chain (RSA, 2019:13). Naos Solar PV Project One is in line with this plan as it proposes the generation of renewable energy from the solar resource and will contribute to the energy mix of the country as set out in this plan.
National Development Plan of 2030	The Presidency: National Planning Commission	-	The National Development Plan aims to "eliminate poverty and reduce inequality by 2030" (RSA, undated). In order to eliminate or reduce inequality, the economy of South Africa needs to grow faster in order to benefit all South Africans. In May 2010 a draft national development plan was drafted, which highlighted the nine (9) key challenges for South Africa. The highest priority areas according to the plan are considered to be the creation of employment opportunities and to improve the quality of national education. In this regard, the plan sets out three (3) priority areas, namely to raise employment by a faster growing economy, improve the quality of education, and to build the capability of the state in order to play a more developmental and transformative role. One of the key challenges identified was that the economy is unsustainably resource intensive and the acceleration and expansion of renewable energy was identified as a key intervention strategy to address this challenge. The development of Naos Solar PV Project One will contribute to the intervention strategy as identified within the plan.
National Infrastructure Plan of South Africa	Presidential Infrastructure Coordinating Commission	2012	In the year 2012 the South African Government adopted a National Infrastructure Plan (hereafter referred to as the Plan). The aim of this Plan is to transform the economic landscape, while strengthening the delivery of basic services and creating new employment opportunities. This Plan also supports the integration of African communities, and also sets out the challenges and enablers that our country needs in order to respond to the planning and development of infrastructure with regards to fostering economic growth (RSA, 2012). The Plan has developed eighteen (18) strategic integrated projects (further referred to as SIPs). These SIPs stretches over all nine (9) provinces, covering social and economic infrastructure, and projects that enhances development and growth. Of the eighteen (18), five (5) are geographically focused, three (3) spatial, three (3) energy, three (3) social infrastructure, two (2) knowledge, one (1) regional integration, and one (1) water and sanitation focussed. The three (3) SIPs according to the Plan, which are energy focused and correlate to the proposed project are as follow:

			- SIP 8: Green energy in support of the South African economy; - SIP 9: Electricity generation to support socio-economic development; and - SIP 10: Electricity transmission and distribution for all. SIP 8 according to the Plan "*support sustainable green energy initiatives on a national scale through a diverse range of clean energy options as envisaged in the IRP 2010 and support bio-fuel production facilities*". The purpose of SIP 9 according to the Plan is to "*accelerate the construction of new electricity generation capacity in accordance with the IRP 2010 to meet the needs of the economy and address historical imbalances*". SIP 9 should also monitor the implementation of major projects such as new power stations like Medupi, Kusile and Ingula. Lastly, SIP 10 aims to "*expand the transmission and distribution network to address historical imbalances, provide access to electricity for all and support economic development*" (RSA, 2012:20). The development of Naos Solar PV Project One is in line with SIP 8 and SIP 9 as it will provide "Green" energy in support of the South African Economy and will generate electricity which supports socio-economic development. The proposed power line associated with the development is in line with SIP 10 as it will facilitate electricity transmission and distribution for all.
New Growth Path Framework	Department of Economic Development	-	The New Growth Path was developed after 16 years of South Africa's democracy, to respond to emerging opportunities and risks while building on policies. This framework provides a dynamic vision on how to collectively achieve a more developed, equitable and democratic society and economy. This framework mainly reflects the commitment of the South African Government to create employment opportunities for its people in all economic policies (RSA, 2011b). This framework sets out the markers for job creation and growth and also identifies where there are viable changes in the character and structure of production, in order to create a more inclusive, greener economy in the long-term. It is stated in the framework that in order for this framework to reach its objectives, the Government is committed to: - Identify the possible areas of employment creation; and

			- Develop a policy to facilitate employment creation especially with regards to social equity, sustainable employment and growth in the creation of employment activities (RSA, 2011b). This framework also identifies investments in five key areas, one of which is energy. This framework also states that the green economy is a priority area, which includes the construction of and investment in renewable energy technologies like solar (RSA, 2011b). In this regard it will also assist creating employment opportunities over the medium- and long-term. Considering that the construction of and investment in renewable energy is a key area identified within the framework, Naos Solar PV Project One is considered to be in-line with the framework.
Climate Change Bill	National Department of Environmental Affairs (now known as the Department of Forestry, Fisheries and the Environment)	2018	On 08 June 2018 the Minister of Environmental Affairs published the Climate Change Bill ("the Bill") for public comment. The Bill provides a framework for climate change regulation in South Africa aimed at governing South Africa's sustainable transition to a climate resilient, low carbon economy and society. The Bill provides a procedural outline that will be developed through the creation of frameworks and plans. The following objectives are set within the Bill: • Provide for the coordinated and integrated response to climate change and its impacts by all spheres of government in accordance with the principles of cooperative governance; • Provide for the effective management of inevitable climate change impacts through enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change, with a view to building social, economic, and environmental resilience and an adequate national adaptation response in the context of the global climate change response; • Make a fair contribution to the global effort to stabilise greenhouse gas concentrations in the atmosphere at a level that avoids dangerous anthropogenic interference with the climate system within a timeframe and in a manner that enables economic, employment, social and environmental development to proceed in a sustainable manner. Naos Solar PV Project One comprises the development of a renewable energy generation facility and would not result in the generation or release of emissions during its operation.

Climate Change Bill	National Department of Forestry, Fisheries and the Environment	2021	The Department of Forestry, Fisheries and the Environment has published a new Climate Change Bill for public comment. The bill notes that climate change represents an urgent threat to human societies and the planet, and requires an effective, progressive and incremental response from both government and citizens. It recognises that South Africa has a global responsibility to reduce greenhouse gases and that the anticipated impacts arising as a result of climate change have the potential to undermine achieving of the country's developmental goals. The main objective of the bill is to enable the development of an effective climate change response and the long-term, just transition to a climate-resilient and lower-carbon economy and society, and to provide for matters connected therewith. Naos Solar PV Project One comprises the development of a renewable energy generation facility and would not result in the generation or release of emissions during its operation.
Strategic Environmental Assessment (SEA) for wind and solar PV Energy in South Africa	National Department of Forestry, Fisheries and the Environment (DFFE)	2014	The then Department of Environmental Affairs (DEA) has committed to contribute to the implementation of the National Development Plan and National Infrastructure Plan by undertaking Strategic Environmental Assessments (SEAs) to identify adaptive processes that integrate the regulatory environmental requirements for Strategic Integrated Projects (SIPs) while safeguarding the environment. The wind and solar photovoltaic (PV) SEA was accordingly commissioned by DEA in support of SIP 8, which aims to facilitate the implementation of sustainable green energy initiatives. This SEA identifies areas where large scale wind and solar PV energy facilities can be developed in terms of SIP 8 and in a manner that limits significant negative impacts on the environment, while yielding the highest possible socio-economic benefits to the country. These areas are referred to as Renewable Energy Development Zones (REDZs). The REDZs also provide priority areas for investment into the electricity grid. Currently one of the greatest challenges to renewable energy development in South Africa is the saturation of existing grid infrastructure and the difficulties in expanding the grid. Proactive investment in grid infrastructure is likely to be the most important factor determining the success of REDZs.

			Although it is intended for the SEA to facilitate proactive grid investment in REDZs, such investment should not be limited to these areas. Suitable wind and solar PV development should still be promoted across the country and any proposed development must be evaluated on its own merit. The proposed site falls within the Klerksdorp REDZ (refer to Figure D).
Free State Provincial Spatial Development Framework (PSDF)	Free State Provincial Government	2012	The Free State PSDF is a policy document that promotes a 'developmental state' in accordance with national and provincial legislation and directives. It aligns with the Free State Provincial Growth and Development Strategy which has committed the Free State to 'building a prosperous, sustainable and growing provincial economy which reduces poverty and improves social development'. The PSDF includes comprehensive plans and strategies that collectively indicate which type of land-use should be promoted in the Province, where such land-use should take place, and how it should be implemented and managed. In broad terms, the PSDF: • Indicates the spatial implications of the core development objectives of the Free State Provincial Growth and Development Strategy. • Serves as a spatial plan that facilitates local economic development. • Lays down strategies, proposals and guidelines as it relates to sustainable development. • Facilitates cross-boundary co-operation between municipalities, adjoining provinces, and bordering countries. • Serves as a manual for integration and standardisation of the planning frameworks of all spheres of government in the Province. The Free State Provincial Growth and Development Strategy states that sustainable economic development is the only effective means by which the most significant challenge of the Free State, namely poverty, can be addressed. The PSDF gives practical effect to sustainable development, which is defined as development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs.

			The PSDF is prepared in accordance with bioregional planning principles that were adapted to suit the site-specific requirements of the Free State. It incorporates and complies with the relevant protocols, conventions, agreements, legislation and policy at all applicable levels of planning, ranging from international to the local level. The PSDF builds upon achievements and learns from mistakes of the past, reacts to the challenges, incorporates the traditional knowledge of the people of the Free State, and builds upon international best-practice and technology. The development of Naos Solar PV Project One is in-line with the framework based on the contributions and opportunities presented by a development of this nature.
Fezile Dabi District Municipality Reviewed Final Integrated Development Plan (IDP)	Fezile Dabi District Municipality	2022-2027	The long-term vision of the Fezile Dabi DM is: "Improving the lives of citizens and progressively meeting their basic, social and economic needs, thereby restoring community confidence and trust in government". The above stated vision defines what Fezile Dabi District Municipality would like to attain over medium to long-term, and for that achievement to effectively materialise, their mission is that: "Fezile Dabi District Municipality will strive to be a more responsive and accountable municipality towards sustainable development". Of the eighteen (18) SIPs that are contained in the National Infrastructure Plan (NIP), there are eight which impact on the Fezile Dabi District and therefore need to be recognised and where appropriate; the municipality's plans will be aligned with these SIPs in an effort to respond to national government's service delivery initiatives. Furthermore, work is to be done to align key cross-cutting areas, namely human settlement planning and skills development in line with each of the Strategic Infrastructure Projects, especially: • Green Energy in support of the South African economy (SIP 8): Supporting sustainable green energy initiatives on a national scale through a diverse range of clean energy options as envisaged in the Integrated Resource Plan (IRP 2010).

			• Electricity Generation to support socio-economic development (SIP 9): acceleration of the construction of new electricity generation capacity in accordance with the IRP 2010 to meet the needs of the economy; and addressing historical imbalances. Considering the plans for the alignment of the DM's plans with SIP 8 and SIP 9 it is confirmed that Naos Solar PV Project One is in line with the plan.
Moqhaka Local Municipality Final Integrated Development Plan (IDP)	Moqhaka Local Municipality	2022 - 2027	The vision of the Moqhaka LM is to "…strive to *be a Municipality that creates an enabling environment for socio-economic growth and sustainable development."* The Mission Statement is *"To maintain and enhance quality of life by providing effective, efficient quality and affordable services equitably and facilitating sustainable socio-economic growth through active community participation."* The vision and mission of the municipality have led to the conceptualisation of the following strategic objectives below: • Broaden access and improve quality of municipal services. • Create an environment that promotes the development of the local economy and facilitates job creation. • Build united, non-racial, integrated and safer communities. • Promote a culture of participatory and good governance. • Improved organisational cohesion and effectiveness. • Improve overall financial management by developing and implementing appropriate financial management policies, procedures, and systems. The development of Naos Solar PV Project One will contribute to the local economy of the area and therefore assist (albeit to a limited extent) with socio-economic growth and therefore contribute to the strategic objectives of the LM.

3.4 OTHER LEGISLATION

Other legislation mainly refers to the following:

- Planning legislation governing the rezoning process and approval of the layout plan.
- Design standards and legislation for services provision such as water, sewerage, electricity, etc.
- Municipal bylaws related to building plans, building regulations, etc.

3.5 RELEVANT GUIDANCE

The following guidance was considered in conducting the BA:

- The Equator principles III (2013)
- World Bank Group Environmental, Health and Safety General Guidelines (EHS Guidelines) (2007)
- Environmental, Health, and Safety Guidelines for Electric Power Transmission and Distribution (2007)
- International Finance Corporation's Policy on Environmental and Social Sustainability (2012)
- DEA. (2013). Draft National Renewable Energy Guideline. Department of Environmental Affairs, Pretoria, South Africa
- DEA, (2012), Guideline 5 – Final companion to the National Environmental Management Act (NEMA) Environmental Impact Assessment (EIA) Regulations of 2010
- DEA, (2012), Guideline 7 – Public participation in the Environmental Impact Assessment process
- DEA, (2012), Guideline 9 – Need and desirability
- DEAT, (2006), Guideline 3 – General guide to the Environmental Impact Assessment Regulations
- DEAT, (2006), Guideline 4 – Public participation in support of the Environmental Impact Assessment Regulations
- DEAT, (2006), Guideline 5 – Assessment of alternatives and impacts in support of the Environmental Impact Assessment Regulations
- BirdLife, (2017). Best Practise Guidelines Birds & Solar Energy: Guidelines for assessing and monitoring the impact of solar power generating facilities on bird in southern Africa.

3.6 CONCLUSION

The Basic Assessment was undertaken in accordance and consideration with with the EIA Regulations (2017) published in GNR 326, in terms of Section 24(5) and 44 of the NEMA as amended as well as all relevant National legislation, policy documents, national guidelines, the World Bank EHS Guidelines, the IFC Performance Standards, and the Equator Principles.

The legislative and policy context plays an important role in identifying and assessing the potential social impacts associated with the proposed development. For this reason, the proposed development project will be assessed and has been considered in terms of its fit with the key legislative, policy and planning documents discussed above.

The main findings of the review of the policy documents on all spheres of Government indicated that strong support was given towards renewable energy, specifically PV solar energy and therefore it is concluded that there is support for the development of Naos Solar PV Project One. The White Paper on the Energy Policy of the Republic of South Africa of 1998 stated that due to the fact that renewable energy resources operate from an unlimited resource base, i.e., the sun, renewable energy can increasingly contribute towards a long-term sustainable energy supply for future generations. This policy further highlights that due to the unlimited resource base of renewable energy in South Africa, renewable energy applications like PV solar energy and associated infrastructure are more sustainable in terms of social and environmental costs. The Integrated Resource Planning for Electricity for South Africa of 2010–2030, the National Infrastructure Plan of South Africa and the New Growth Path Framework all support the development of the renewable energy sector. In particular, the IRP also indicated that 43% of the energy generation in South Africa is allocated to renewable energy applications.

On a District and Local level limited attention is given explicitly to renewable sources like PV solar energy, however the documents reviewed do make provision for increase energy supply and efficiency in improving the quality of lives in terms of efficient physical infrastructure as well as socio-economic growth. At Provincial, District and Local level the policy documents indirectly support the applications of renewables as it will contribute to the surety of electricity supply and improving the lives of the community.

The review of the relevant policies and documents related to the energy sector therefore indicate that renewables, like solar energy and the establishment of solar energy facilities and associated infrastructure, are supported on all spheres of Government. The proposed Naos Solar PV Project One is therefore supported by the related policy and planning documents reviewed in this section of the report.

4 THE NEED AND DESIRABILITY

This section aims to address the following requirements of the regulations:

Appendix 1. (3) An BAR (...) must include-

(f) a motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location;

4.1 THE NEED FOR THE PROPOSED ACTIVITY

The proposed activity is a direct result of the growing demand for electricity and the need for renewable energy in South Africa. According to Eskom, the demand for electricity in South Africa has been growing at approximately 3% per annum. This growing demand, fuelled by increasing economic growth and social development, is placing increasing pressure on South Africa's existing power generation capacity. Coupled with this, is the growing awareness of environmentally responsible development, the impacts of climate change and the need for sustainable development.

Over 90% of South Africa's electricity generation is coal based, the Word bank estimates that this results in an annual, per capita carbon emission of ~8.9 tons per person. Based on 2008 fossil-fuel CO_2 emissions statistics released by the Carbon Dioxide Information Analysis Centre, South Africa is the 13th largest carbon dioxide emitting country in the world and the largest emitter in Africa (Boden, et al. 2011). In August 2021 an article confirmed that South Africa is the 12th highest greenhouse gas emitter in the world (source: https://www.news24.com/fin24/economy/eskom-will-only-able-to-meet-global-air-quality-standards-by-2050-owing-to-financial-woes-20210818).

The proposed project is intended to form part of the Department of Mineral Resources and Energy's (DMREs) Renewable Energy Independent Power Producer Procurement (REIPPP) Programme or any other appropriate energy generation programmes / opportunities. The REIPPP Programme aims to secure 14 725 Megawatts (MW) of new generation capacity from renewable energy sources, while simultaneously diversifying South Africa's electricity mix. According to the 2021 State of the Nation Address, Government will soon be initiating the procurement of an additional 11 800 MW of power from renewable energy, natural gas, battery storage and coal in line with the Integrated Resource Plan 2019 and fulfilling their commitments under the United Nations Framework Convention on Climate Change and its Paris Agreement which include the reduction of greenhouse gas emissions. Eskom, the largest greenhouse gas emitter of South Africa, has committed in principle to net zero emission by 2050 and to increase its renewable capacity. During the 2022 State of the Nation Address it was indicated that the government had taken "firm steps" to bring additional generation capacity online as quickly as possible to close the shortfall in terms of electricity. As a result, it was confirmed that several new generation projects will be coming online over the next few years.

Besides capacity additions, several assumptions have changed since the promulgation of the IRP 2010–2030. Key assumptions that changed include the electricity demand projection, Eskom's existing plant performance, as well as new technology costs. These changes

necessitated the review and update of the IRP which resulted in the draft IRP 2018 as per table 4.1 below:

Table 4.1: Published Draft IRP 2018 (Approved by Cabinet for Consultation)

	Coal	Nuclear	Hydro	Storage (Pumped Storage)	PV	Wind	CSP	Gas / Diesel	Other (CoGen, Biomass, Landfill)	Embedded Generation
2018	39 126	1 860	2 196	2 912	1 474	1 980	300	3 830	499	Unknown
2019	2 155					244	300			200
2020	1 433				114	300				200
2021	1 433				300	818				200
2022	711				400					200
2023	500									200
2024	500									200
2025					670	200				200
2026					1 000	1 500		2 250		200
2027					1 000	1 600		1 200		200
2028					1 000	1 600		1 800		200
2029					1 000	1 600		2 850		200
2030			2 500		1 000	1 600				200
TOTAL INSTALLED	33 847	1 860	4 696	2 912	7 958	11 442	600	11 930	499	2600
Installed Capacity Mix (%)	44.6	2.5	6.2	3.8	10.5	15.1	0.9	15.7	0.7	

Installed Capacity
Committed / Already Contracted Capacity
New Additional Capacity (IRP Update)

According to the South African Energy Sector Overview (2021), there is currently 1 723MW of installed PV capacity, while an additional 2 600MW from wind and solar has been rewarded as part of Bid Window 5.

In December of 2022, five solar energy preferred bidders were announced by the Department of Mineral Resources and Energy under Bid Window 6, with a total capacity amounting to 860MW.

4.2 THE DESIRABILITY OF THE PROPOSED ACTIVITY

The facility's contribution towards sustainable development and the associated benefits to society in general is discussed below:

- Lesser dependence on fossil fuel generated power - The deployment of the facility will have a positive macro-economic impact by reducing South Africa's dependence on fossil fuel generated power and assisting the country in meeting its growing electricity demand.
- Increased surety of supply - By diversifying the sources of power in the country, the surety of supply will increase. The power demands of South Africa are ever increasing and by adding solar power this demand can be met, even exceeded without increasing pollution in relation to the use of fossil fuels. The project has the potential of "securing" economic activity by assisting in removing supply constraints if Eskom generation activities result in a supply shortfall. When supply is constrained, it

represents a limitation to economic growth. When a supply reserve is available, it represents an opportunity for economic growth.

- Local economic growth - The proposed project will contribute to local economic growth by supporting industry development in line with provincial and regional goals and ensuring advanced skills are drawn to the Free State Province. The project will likely encounter widespread support from government, civil society and businesses, all of whom see potential opportunities for revenues, employment and business opportunities locally. The development of the photovoltaic solar facility will in turn lead to growth in tax revenues for local municipalities and sales of carbon credits, resulting in increased foreign direct investment.
- Lower costs of alternative energy - An increase in the number of solar facilities commissioned will eventually reduce the cost of the power generated through solar facilities. This will contribute to the country's objective of utilising more renewable energy and less fossil fuel-based power sources. It will assist in achieving the goal to generate 14 725 MW of electricity from renewable energy as per the Renewable Energy Independent Power Producer Procurement (REIPPP) Programme of the Department of Mineral Resources and Energy.
- Reduction in greenhouse gas emissions - The additional power supplied through solar energy will reduce the reliance on the combustion of fossil fuels to produce power. The South African electricity grid is predominantly coal-fired and therefore Greenhouse Gas (GHG) emissions intensive (coal accounts for more than 92% of the fuel used in South Africa's electricity generation). The reduction of GHG emissions as a result of the project implementation will be achieved due to reduction of CO_2 emissions from combustion of fossil fuels at the existing grid-connected power plants and plants which would likely be built in the absence of the project activity.
- CDM Project - A solar energy facility also qualifies as a Clean Development Mechanism (CDM) project (i.e., a financial mechanism developed to encourage the development of renewable technologies).
- Climate change mitigation - On a global scale, the project makes a contribution to greenhouse gas emission reduction and therefore contributes toward climate change mitigation.
- Reduced environmental impacts - The reduction in electricity consumed from the grid will not only result in a reduction in greenhouse gas emissions, but also the prevention of negative impacts associated with coal mining. For example, coal power requires high volumes of water, in areas of South Africa where water supply is already over-stretched and water availability is highly variable. Photovoltaic solar energy technology also does not produce the sulphur emissions, ash or coal mining concerns associated with conventional coal fired electricity generation technologies resulting in a relatively low level of environmental impacts. It is a clean technology which contributes toward a better-quality environment for employees and nearby communities.
- Social benefits - The project activity is likely to have significant long-term, indirect positive social impacts that may extend to a regional and even national scale. The larger scale impacts are to be derived in the utilisation of solar power and the

experience gained through the construction and operation of the solar development. In future, this experience can be employed at other similar solar installations in South Africa.

- Provision of job opportunities - The main benefit of the proposed development operating in the area is that local companies or contractors will be hired for the duration of the construction period. The operational phase will provide permanent job opportunities to the local communities from the surrounding area since security guards and general labourers will be required on a full-time basis. Approximately 1000 employment opportunities will be created during the construction and ~25 during the operational phases.

- Indirect socio-economic benefits - The increase in the demand for services such as accommodation, transportation, security, general maintenance and catering will generate additional indirect socio-economic benefits for the local community members.

- Effective use of resources – The Soils and Agricultural Impact Assessment (Appendix D4) has confirmed that there are historical crop fields present within the affected property that have note been used by the landowner for several years due to the limited capabilities. These abandoned areas were previously used for maize fields and grazing. The sandy soils observed on site indicated drainage and waterlogging problems which can either be caused by shallow soil profile depths or occurrence of a restrictive substratum layer below. The Land Capability Sensitivity indicates that most "crop fields" (now abandoned) are within low to moderate capability sensitivity areas. The productivity and crop feasibility of these areas as determined by an Agricultural Economic Specialist assessment (Appendix D8) also confirms that they have a low productive potential. Furthermore, the applicant has obtained consent from the landowners for use of these farm areas for the development. The proposed development in this specific area will generate alternative land use income through rental for the energy facility, which will have a positive impact on agriculture and enable the landowner to explore and implement other agricultural activities which will have a positive impact not only for the landowner but also the surrounding communities with additional agricultural employment opportunities becoming available. It will provide the farming enterprise with increased cash flow and rural livelihood, and thereby improve the financial sustainability of agricultural activities by the landowner.

- Location of the activity within a REDZ - The Renewable Energy Development Zones (REDZ) have a key role to play in South Africa's just energy transition. The REDZ create priority areas for investment in the electricity grid. Since the site is located within a REDZ it contributes to the desirability of the project.

- Cumulative impacts of low to medium significance – No cumulative impacts with an unacceptable residual risk have been identified. In terms of the desirability of the development of sources of renewable energy, it may be preferable to incur a higher cumulative loss in such a region as this one, which is characterised by a landscape that has been transformed by agriculture and mining activities, than to lose land with a higher environmental value elsewhere in the country.

5 DESCRIPTION OF ENVIRONMENTAL ISSUES

This section aims to address the following requirements of the regulations:

Appendix 1. (3) A BAR (...) must include-

(g) A motivation for the preferred site, activity and technology alternative;

(h) a full description of the process followed to reach the proposed preferred alternative, within the site, including –

(i) details of all the alternatives considered;

(ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;

(iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;

(iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;

(viii) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives;

(x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such; and

(xi) a concluding statement indicating the preferred alternative development location within the approved site.

5.1 CONSIDERATION OF ALTERNATIVES

The DEAT 2006 guidelines on 'assessment of alternatives and impacts' proposes the consideration of four types of alternatives namely, the no-go, location, activity, and design alternatives. It is however, important to note that the regulation and guidelines specifically state that only 'feasible' and 'reasonable' alternatives should be explored. It also recognizes that the consideration of alternatives is an iterative process of feedback between the developer and EAP, which in some instances culminates in a single preferred project proposal. An initial site assessment was conducted by the developer of the affected property and the farm portion was found favourable due to the availability of the land for development, proximity to grid connections, solar radiation, ecology and relatively flat terrain. These factors were then taken into consideration and avoided as far as possible.

The following alternatives were considered in relation to the proposed activity and all specialists should also make mention of these:

5.1.1 No-go alternative

This alternative considers the option of 'do nothing' and maintaining the status quo. The description provided in section 5.3 of this report could be considered the baseline conditions (*status quo*) to persist should the no-go alternative be preferred. The site is currently zoned for agricultural land uses. Should the proposed activity not proceed, the site will remain unchanged and will continue to be used for grazing of cattle and crop production (refer to the photographs of the site included in the plates).

The Soils and Agricultural Impact Assessment (Appendix D4) has confirmed that there are historical crop fields present within the affected property that have note been used by the landowner for several years due to the limited capabilities. These abandoned areas were previously used for maize fields and grazing. The sandy soils observed on site indicated drainage and waterlogging problems which can either be caused by shallow soil profile depths or occurrence of a restrictive substratum layer below. The Land Capability Sensitivity indicates that most "crop fields" (now abandoned) are within low to moderate capability sensitivity areas. The productivity and crop feasibility of these areas as determined by an Agricultural Economic Specialist assessment (Appendix D8) also confirms that they have a low productive potential. Furthermore, the applicant has obtained consent from the landowners for use of these farm areas for the development. The proposed development in this specific area will generate alternative land use income through rental for the energy facility, which will have a positive impact on agriculture and enable the landowner to explore and implement other agricultural activities which will have a positive impact not only for the landowner but also the surrounding communities with additional agricultural employment opportunities becoming available. It will provide the farming enterprise with increased cash flow and rural livelihood, and thereby improve the financial sustainability of agricultural activities by the landowner.

The implementation of the no-go alternative is therefore not preferred.

5.1.2 Location alternatives

This alternative asks the question, if there is not, from an environmental perspective, a more suitable location for the project. No other properties have at this stage been secured by Naos Solar PV Project One (Pty) Ltd in the Orkney/ Viljoenskroon area to potentially establish the solar energy facility. From a local perspective, Portion 1 of the Farm Waterford No. 573, is preferred due to its suitable climatic conditions and solar resource, topography (i.e. in terms of gradient), environmental conditions (i.e. ecological sensitivity), proximity to a feasible grid connection point (i.e. for the purpose of electricity evacuation), as well as site access (i.e. to facilitate the movement of machinery, equipment, infrastructure and people during the construction phase).

The proposed development falls within an area used for grazing and crop production. The site is considered to have limited environmental sensitivity as a result. Furthermore, the Agricultural Economic Assessment (Appendix D9) has indicated that areas which are under crop production or that have historically been cultivated provides a very low agricultural value and profit for the landowner, and therefore the landowner considers the development of the facility within such areas as an opportunity to expand his agricultural activities in other ways through the additional income that will be received from the Naos Solar PV Project One.

Within the affected property an area of 550 hectares have been assessed and a preferred development footprint has been designed within this area.

No alternative areas for the development footprint within the affected property have been considered for the placement of infrastructure based on feedback from the landowner and the current land use areas (i.e. productive agricultural areas). Therefore, there is a single preferred location alternative that will be assessed – refer to Figure 5.1 below.

Figure 5.1: Location of the preferred alternative for the Naos Solar PV Project One

5.1.3 Activity alternatives

The BA process also needs to consider if the development of a solar PV facility would be the most appropriate land use for the particular site.

- **Photovoltaic (PV) solar facility** – Naos Solar PV Project One (Pty) Ltd is part of a portfolio of solar PV projects throughout South Africa. Naos Solar PV Project One (Pty) Ltd is of the opinion that solar PV technology is appropriately suited to the site, given the high irradiation values for the Orkney / Viljoenskroon area – refer to Figure 5.2. The technology furthermore entails low visual impacts, have relatively low water requirements, is a simple and reliable type of technology and all the components can be recycled.
- **Wind energy facility** - Due to the local climatic conditions a wind energy facility is not considered suitable as the area does not have the required wind resource. Furthermore, the applicant has opted for the generation of electricity via solar power rather than the

use of wind turbines. This alternative is therefore regarded as not feasible and will not be evaluated further in this report.

- **Concentrated solar power (CSP) technology** - CSP technology requires large volumes of water which is a major constraint for this type of technology. While the irradiation values are high enough to generate sufficient solar power, the water constraints render this alternative not feasible. The development of CSP is also no longer listed as part of the energy mix indicated in the IRP. The cost of CSP is also significantly higher than the highly competitive costs for Solar PV. Therefore, this alternative will not be considered further in this report.

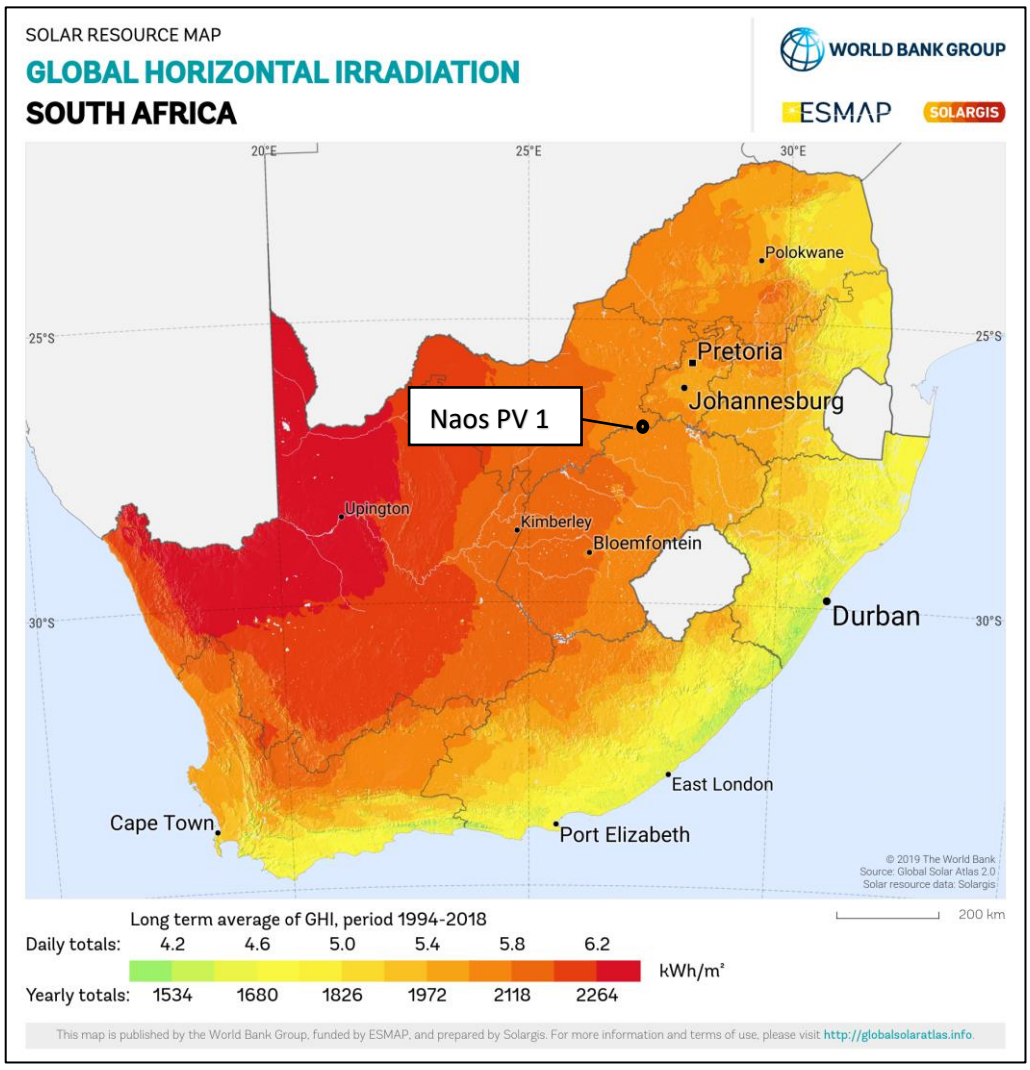


Figure 5.2: Global horizontal irradiation values for South Africa (SolarGIS, 2021) and the location of the Naos Solar PV Project One

5.1.4 Technical alternatives

Possible technical alternatives for the development of a solar PV facility needs to be considered during the BA process.

5.1.4.1 Grid Connection

Connecting the array to the electrical grid requires the transformation of the voltage from 33kV to 132kV. The normal components and dimensions of a distribution-rated electrical substation will be required. A collector substation with a capacity of 33kV/132kV will also be required.

The onsite substation will be required on site to step the voltage up to 33kV/132kV, after which the power will be evacuated into the national grid via the new proposed power line from the proposed collector substation to the 132/400kV Mercury Main Transmission Substation (MTS).

Two collector substation alternative locations are under assessment. Specific internal power lines to connect the collector substation to the main grid connection corridor, which will ultimately evacuate the generated power into the national grid, is also being proposed as part of the required grid connection infrastructure.

Should the three developments (i.e. Naos Solar PV Project One, Two and Three) all be developed then there would be an overlap of the internal 33kV/132kV power lines that will be shared between the facilities to reduce the extent of linear infrastructure required).

It must be noted that Collector Substation Option 1 is put forward as the technically preferred option for the project layout.

The capacity of the collector substation will be 33kV/132kV and the capacity of the internal power lines will be 33kV/132kV. The length of the internal power lines will be up to 4km.

Figure 5.3 below provides an indication of the internal grid connection solution for Naos Solar PV Project One, including the location of the two collector substation locations within the facility layout proposed for the development.

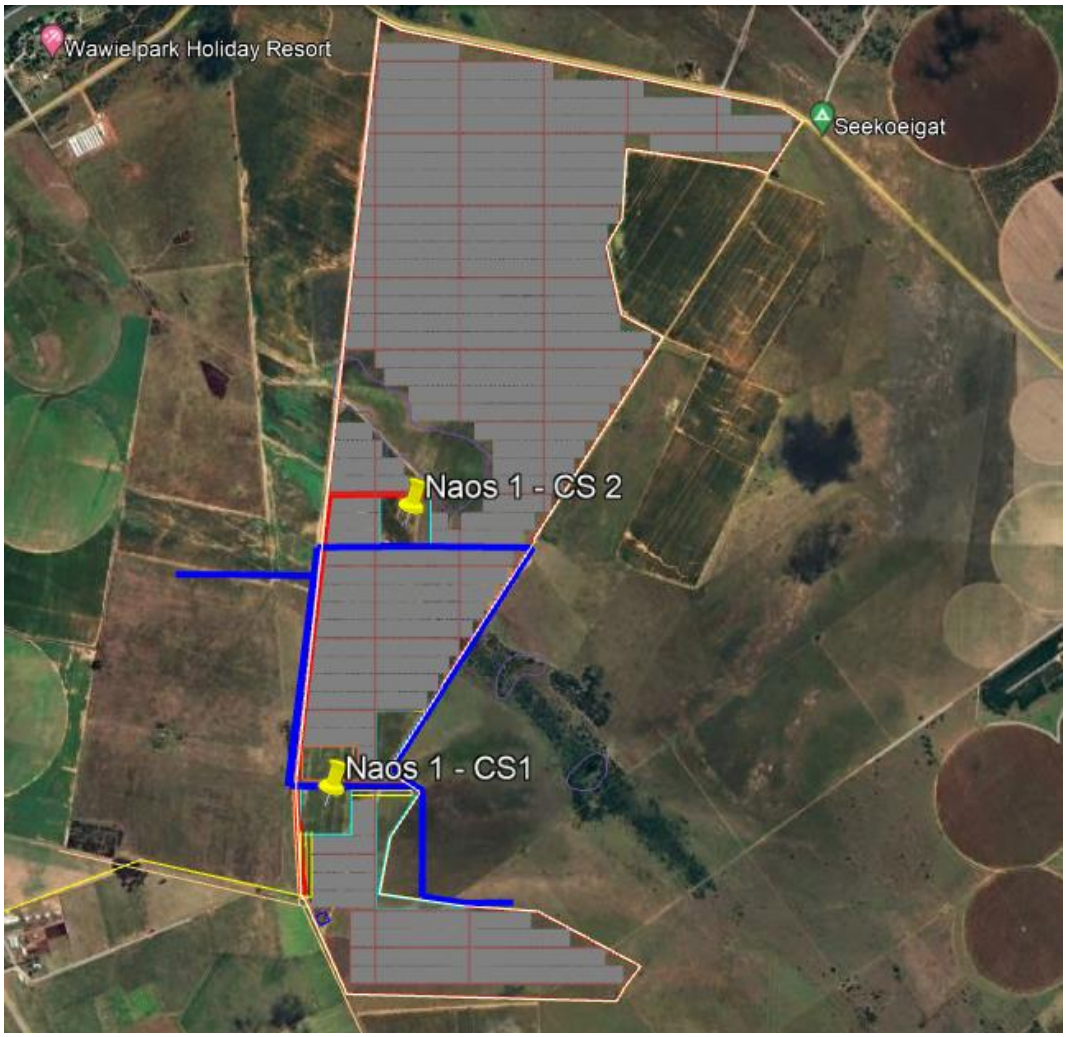


Figure 5.3: : Internal grid connection solution, with two collector substation (CS) alternative locations, for Naos Solar PV Project One (red lines = Naos 1 132kV Eskom power line connecting to the main grid connection corridor for each collector substation alternative, blue lines = Naos 2 & 3 132kV power lines crossing over the Naos Solar PV Project One)

The 132kV power line to connect the facility to the 132/400kV Mercury Main Transmission Substation is under assessment within a 200m wide grid connection corridor. Six alternative routes are being considered. Refer to Figure 5.4.

The lengths of the six power line alternatives are as follow:

- Power Line Alternative 1A – up to 8km
- Power Line Alternative 1B (technically preferred) – up to 8km
- Power Line Alternative 1C – up to 8km
- Power Line Alternative 2 – up to 7km
- Power Line Alternative 3 – up to 7km
- Power Line Alternative 4 – up to 7.5km

It must be noted that all six alternatives are also under assessment as part of the respective Basic Assessment processes for the proposed Naos Solar PV Project Two and Naos Solar PV Project Three.

Power lines can be either overhead or underground. A 132kV overhead distribution line is the only preferred alternative for the applicant due to the following reasons:

- **Overhead Distribution Lines** - Overhead lines are less costly to construct than underground lines. It also minimises exposure to vandalism and theft. Therefore, the preference for the development of overhead lines is mainly based on the grounds of cost. Overhead lines allow high voltage operations, and the surrounding air provides the necessary electrical insulation to earth. Further, the surrounding air cools the conductors that produce heat due to lost energy (Swingler et al, 2006).

  The overall weather conditions in the Free State Province are unlikely to cause damage and faults on the proposed overhead transmission power line. Nonetheless, if a fault occurs, it can be found quickly by visual means using a manual line patrol. Repair to overhead lines is relatively simple in most cases the line can usually be put back into service within a few days. In terms of potential impacts caused by overhead transmission lines include visual intrusion and threats to sensitive habitat (where applicable).

  Furthermore, overhead power lines also provide an opportunity for the avoidance of sensitive environmental features as the overhead lines can span on-ground environmental features to ensure conservation, therefore providing more flexibility in terms of mitigation of the associated on-ground disturbance.

  The choice of structure to be used for the power line will be determined in consultation with Eskom once the Engineers have assessed the geotechnical and topographical conditions and decided on a suitable structure which meets the prescribed technical requirements. The choice of structures to be used will not have any adverse impacts on the environment. The line will be constructed according to the authorised standards for a power line approved by Eskom Holdings SoC Ltd.

  The following alternatives may be considered for the overhead power line:

  - Single Circuit Overhead Power Line

    The use of single circuit overhead power lines to distribute electricity is considered the most appropriate technology and has been designed over many years for the existing environmental conditions and terrain as specified in the Eskom Specifications and best international practice. Based on all current technologies available, single circuit overhead power lines are considered the most environmentally practicable technology available for the distribution of power. This option is considered appropriate for the following reasons:

    - More cost-effective installation costs;
    - Less environmental damage during installation; and
    - More effective and cheaper maintenance costs over the lifetime of the power line.

- Double Circuit Overhead Power Line

  Where sensitive environmental features are identified, and there is sufficient justification, Eskom will consider the use of double circuit (placing 2 power lines on either side of the same tower structure) to minimise impacts. However, the use of double-circuiting has a number of technical disadvantages, which includes faults or problems on one power line that may mean that the other power line is also disabled during maintenance, and this will affect the quality of supply to an area. Larger and taller towers as well as more towers are required for double-circuit power lines.

  The double-circuit overhead power line proves more feasible since the single circuit may not have the capacity to transmit the large amount of electricity generated from the plant and during maintenance the entire plant would not have to be offline as one of the double circuit lines would still be able to supply electricity. However, due to the rapid requirement changes, this will only be determined before construction.

- **Underground Distribution Lines** - Underground cables have generally been used where it is impossible to use overhead lines for example because of space constraints. Underground cables are oil cooled and are also at risk of groundwater contamination. Maintenance is also difficult on underground lines compared to overhead lines. When a fault occurs in an underground cable circuit, it is almost exclusively a permanent fault due to poor visibility. Underground lines are also more expensive to construct than overhead lines.

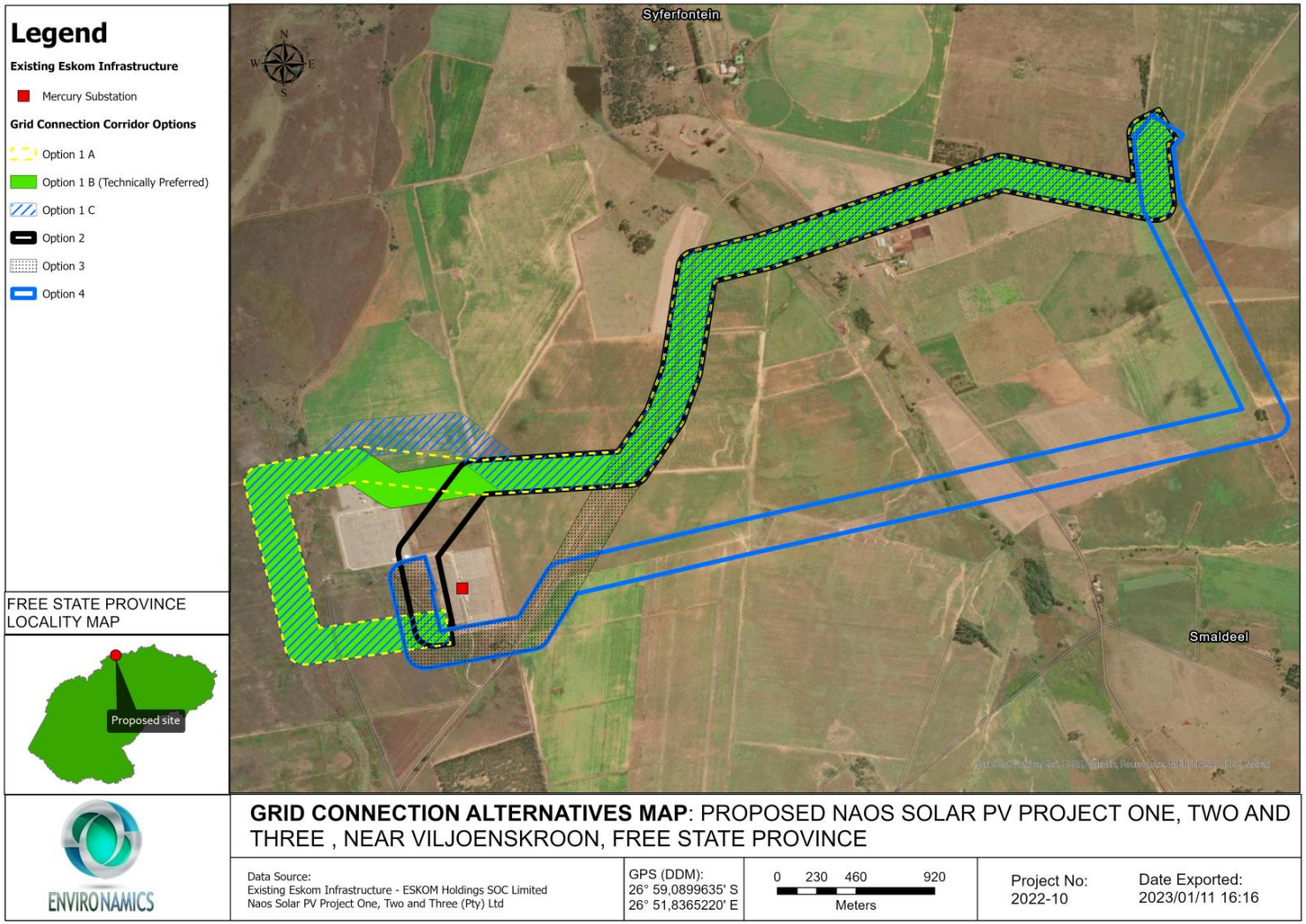


Figure 5.4: Six grid connection corridor alternatives under assessment to connect Naos Solar PV Project One to the existing 132/400kV Mercury Main Transmission Substation

5.1.4.2 Main Access Road Alternatives

In order to gain access to the site four alternative main access routes are being proposed for the development. These include the following:

- Preferred Access Road (Main Road) - 12.6km
- Alternative 1 – 25.6km
- Alternative 2 – 27.5km
- Alternative 3 – 14.6km

The Preferred Access Road (Main Road) follows the S643, where it then crosses over the Vaal River via the Vermaasdrift Bridge and provides direct access to the projects via an existing gravel farm road. Upgrading of sections of the road to accommodate the construction traffic will be undertaken where required. This route is considered to be the shortest route to the site from the R502 regional road and is therefore considered to be the ideal route for the delivery of equipment.

Alternative 1 provides access to the sites from the south via the R76 regional road, which connects to a gravel farm road which further leads to the existing Vermaasdrift Road. This road is ideal for the delivery of equipment and specifically the transformers. Upgrading of sections of the road to accommodate the construction traffic will be undertaken where required.

Alternative 2 provides access to the sites from the south via the R76 regional road, which connects to a gravel farm road which provides direct access to the sites. This road is ideal for the delivery of equipment and specifically the transformers. Upgrading of sections of the road to accommodate the construction traffic will be undertaken where required.

Alternative 3 provides access to the sites from the west via the R76 regional road, which connects to a gravel farm road which crosses over the existing Vermaasdrift Road and provides direct access to the sites. This road is ideal for the delivery of equipment and specifically transformers. Upgrading of sections of the road to accommodate the construction traffic will be undertaken where required, and a section of new road of about 5km long and 8m wide will need to be undertaken.

The technically preferred alternatives are the use of the Main Road and Alternative 2 collectively for the project as these two options provide the most technically sensible solution for the transportation of goods and services to and from the sites, including consideration of the road requirement for the transportation of the transformer. It is therefore requested that the Main Road and Alternative 2 both be authorised for the developments.

Refer to the Figure 5.5 below.

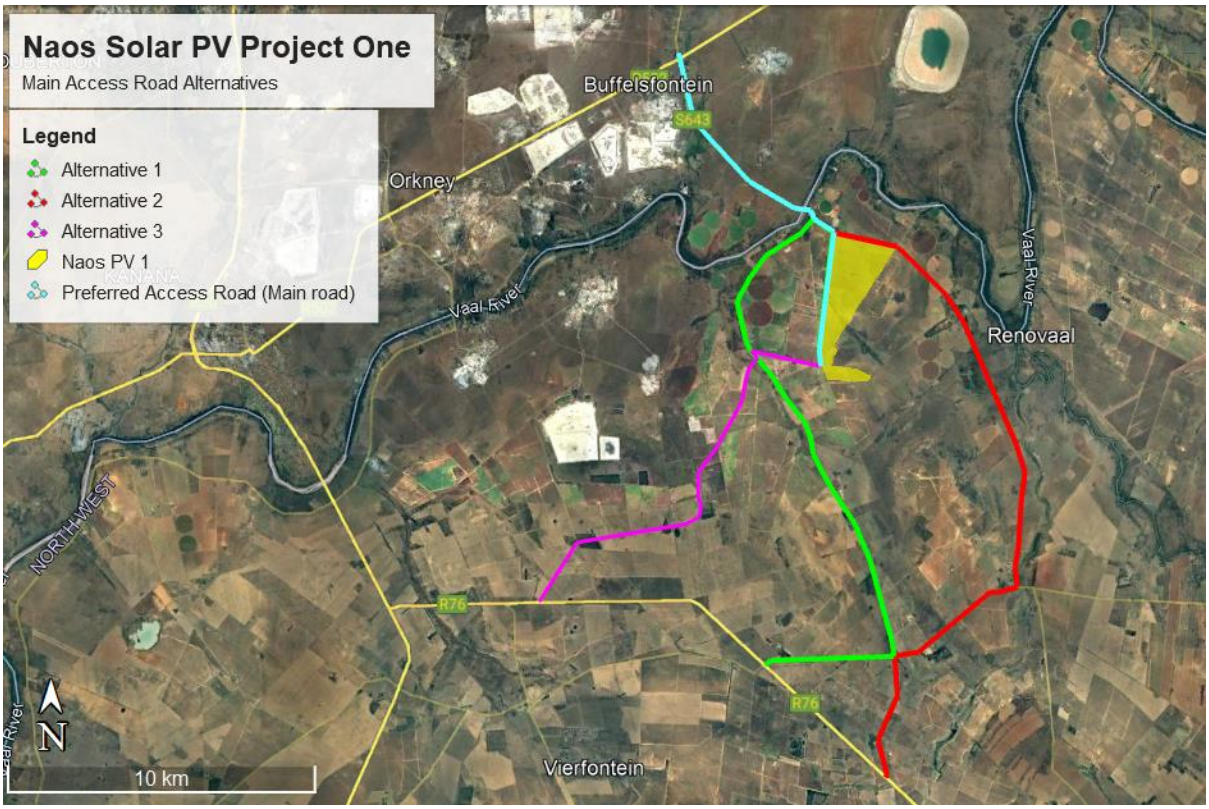


Figure 5.5: Main access route alternatives proposed and under assessment for the Naos Solar PV Project One

5.1.4.3 Battery Energy Storage Facility (BESS)

It is proposed that a Battery Energy Storage Facility for grid storage would be housed in stacked containers, or multi-storey buildings. The battery energy storage system will make use of Lithium-ion (Lithium Iron Phosphate / Sodium Sulphur) or Vanadium Redox technology and will have a capacity of up to 4.5GWh. The extent of the system will be ~4.57ha. It must be noted that should the facility layout not require the development and operation of a BESS, the area allocated for the placement of the BESS will be used for panel placement within the development footprint.

While there are various battery storage technologies available, the preferred alternative is the utility-scale Lithium-ion (Li-ion) battery energy storage. Li-ion batteries have emerged as the leading technology in utility-scale energy storage applications because it offers the best mix of performance specifications, such as high charge and discharge efficiency, low self-discharge, high energy density, and long cycle life (Divya KC et al., 2009).

Battery storage offers a wide range of advantages to South Africa including renewable energy time shift, renewable capacity firming, electricity supply reliability and quality improvement, voltage regulation, electricity reserve capacity improvement, transmission congestion relief, load following and time of use energy cost management. In essence, this technology allows renewable energy to enter the baseload and peak power generation market and therefore can compete directly with fossil fuel sources of power generation and offer a truly sustainable electricity supply option.

5.1.5 Design and layout alternatives

Design alternatives were considered throughout the planning and design phase (i.e. what would be the best design option for the development?). In this regard discussions on the design were held between the EAP and the developer. The layout plan is included in Appendix H and Figures H and I.

The layout follows the limitations of the site and aspects such as environmental sensitive areas (supported by specialist input), roads, areas under crop production considered as valuable by the landowner, fencing and servitudes are considered. The total surface area proposed for the layout include the PV panel arrays spaced to avoid shadowing, access and maintenance roads and associated infrastructure (buildings, power inverters, power lines and substations, BESS and perimeter fences). With regards to the structure orientation, the panels will either be fixed to a single-axis horizontal tracking structure where the orientation of the panel varies according to the time of the day, as the sun moves from east to west or tilted at a fixed angle equivalent to the latitude at which the site is located in order to capture the most sun.

The choice of pylon structure to be used for the power lines will be determined in consultation with Eskom. The choice of pylon structure does not significantly affect the environmental impacts of the proposed development as provision has already been made for the visual, ecological, avifaunal and paleontological impacts of erecting a power line. No defined structure has been confirmed at this stage and will depend on Eskom's technical requirements. The 33kV/132kV power lines must be constructed according to the authorised standards for a power line approved by Eskom Holdings SoC Ltd. The structure to be utilised for the power line towers will also be informed by the local geotechnical and topographical conditions. The following alternatives are considered with regards to the proposed structures:

Steel lattice towers:

The steel lattice towers provide the following advantages over the other tower types available:

- Enables multipath earthing which enhances the overall electrical performance of the power line.
- Is visually less obtrusive than the mono-pole options.
- Is more practicable than other options i.e., more cost effective and more practical to construct and maintain.
- Is safer to work on than the monopole and wood pole structures.
- Is more durable than the wood pole structures.

Steel monopoles:

The steel monopole is considered less suitable than the steel lattice towers for the following reasons:

- Is visually more intrusive than the lattice towers.
- Is more expensive than the lattice towers.
- Requires more steel than the lattice towers.

- Is more difficult to erect.
- Is not as safe to work on as the lattice towers.

Wood poles:

Wood pole structures are only used in extreme circumstances where a visual impact needs to be avoided. Wood pole structures may be cheaper to produce and to construct, but they have one tenth of the lifespan of the metal counterparts and are far more susceptible to weather conditions which makes them less efficient and practicable. The wood pole structure is also more susceptible to having the cross arms burnt off by electrical faults as well as being susceptible to deformation with height.

5.1.6 Technology alternatives

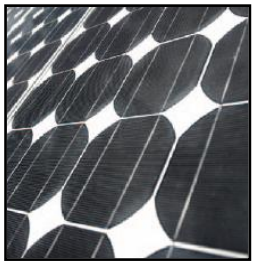
Technology alternatives for the development of a solar PV facility needs to be considered during the BA process.

5.1.6.1 Photovoltaic solar panels

There are several types of semiconductor technologies currently available and in use for PV solar panels. Two, however, have become the most widely adopted, namely crystalline silicon, thin film or bifacial PV panels. These technologies are discussed in more detail below:

- **Crystalline (high efficiency technology at higher cost)**

  Crystalline silicon panels are constructed by first putting a single slice of silicon through a series of processing steps, creating one solar cell. These cells are then assembled together in multiples to make a solar panel. Crystalline silicon, also called wafer silicon, is the oldest and the most widely used material in commercial solar panels. Crystalline silicon modules represent 85-90% of the global annual market today. There are two main types of crystalline silicon panels that can be considered for the solar facility:



- ***Mono-crystalline Silicon*** - mono-crystalline (also called single crystal) panels use solar cells that are cut from a piece of silicon grown from a single, uniform crystal. Mono-crystalline panels are among the most efficient yet most expensive on the market. They require the highest purity silicon and have the most involved manufacturing process.

- ***Poly-crystalline Silicon*** – poly-crystalline panels use solar cells that are cut from multifaceted silicon crystals. They are less uniform in appearance than mono-crystalline cells, resembling pieces of shattered glass. These are the most common solar panels on the market, being less expensive than mono-crystalline silicon. They are also less efficient,

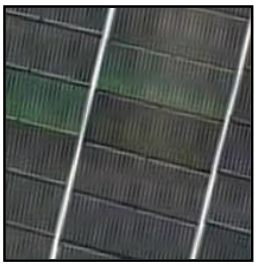
though the performance gap has begun to close in recent years (First Solar, 2011).

- **Thin film (low-cost technology with lower efficiency)**

Thin film solar panels are made by placing thin layers of semiconductor material onto various surfaces, usually on glass. The term *thin film* refers to the amount of semiconductor material used. It is applied in a thin film to a surface structure, such as a sheet of glass. Contrary to popular belief, most thin film panels are not flexible. Overall, thin film solar panels offer the lowest manufacturing costs, and are becoming more prevalent in the industry. Thin films currently account for 10-15% of global PV module sales. There are three main types of thin film used:

- ***Cadmium Telluride (CdTe)*** - CdTe is a semiconductor compound formed from cadmium and tellurium. CdTe solar panels are manufactured on glass. They are the most common type of thin film solar panel on the market and the most cost-effective to manufacture. CdTe panels perform significantly better in high temperatures and in low-light conditions.

- ***Amorphous Silicon*** - Amorphous silicon is the non-crystalline form of silicon and was the first thin film material to yield a commercial product, first used in consumer items such as calculators. It can be deposited in thin layers onto a variety of surfaces and offers lower costs than traditional crystalline silicon, though it is less efficient at converting sunlight into electricity.



- ***Copper, Indium, Gallium, Selenide (CIGS)*** - CIGS is a compound semiconductor that can be deposited onto many different materials. CIGS has only recently become available for small commercial applications and is considered a developing PV technology (First Solar, 2011).

- **Bifacial panels:**

As the name suggests, bifacial solar panels have two faces, or rather, they can absorb light from both sides of the panel. A lot of potential energy transfer is lost in traditional solar cells when the light hits the back of a solar panel. Most bifacial solar panels use monocrystalline cells, whereas traditional cells use polycrystalline materials. The monocrystalline materials, alongside the clear light pathway on both sides of the panel, enable the light to be absorbed from either side of the cell, and it is thought that the

overall efficiency of these cells can be up to 30% greater in commercial applications. Although, the exact amount is variable depending on the surface that they are installed on. The front side of the solar panel still absorbs most of the solar light, but the back side of the solar panel can absorb between 5-90% of the light absorbed by the front of the solar panel.

Traditional solar panels use an opaque back sheet. By comparison, bifacial solar panels either have a clear/reflective back sheet or have dual panes of glass. Most of these solar panels are frameless so any issues with potential-induced degradation (PID) are reduced. To efficiently convert light into electricity from both sides, bifacial solar cells have selective-area metallization schemes that enable light to pass between the metallized areas, rather than the conventional thick metal collectors as seen with monofacial solar panels.

The technology that (at this stage) proves more feasible and reasonable with respect to the proposed solar facility is crystalline silicon panels, due to it being non-reflective, more efficient, and with a higher durability. However, due to the rapid technological advances being made in the field of solar technology the exact type of technology to be used, such as bifacial panels, will only be confirmed at the onset of the project.

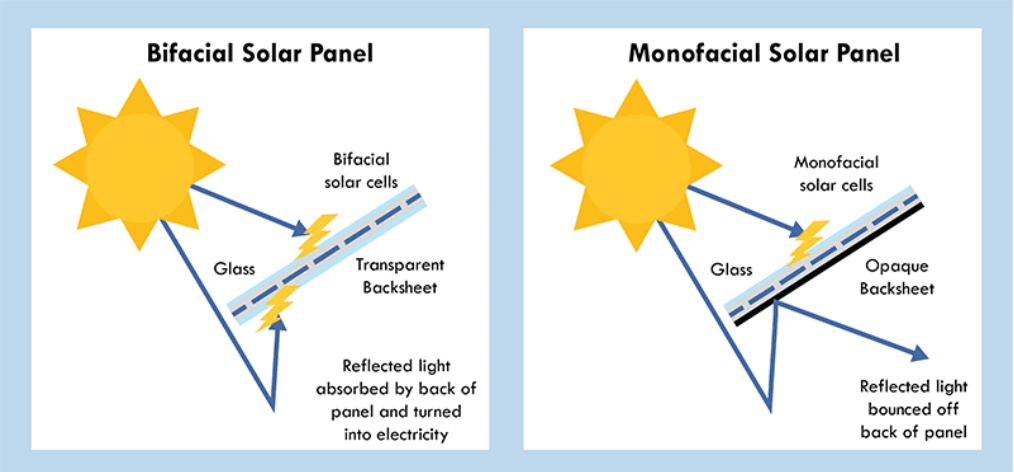


Figure 5.6: Bifacial vs Monofacial Solar Panel absorption

5.2 PUBLIC PARTICIPATION PROCESS

The following sections provide detailed information on the public participation process conducted in terms of Regulations 39 to 44.

5.2.1 General

The public participation process was conducted strictly in accordance with Regulations 39 to 44. The following three categories of variables were taken into account when deciding the required level of public participation:

- The scale of anticipated impacts
- The sensitivity of the affected environment and the degree of controversy of the project
- The characteristics of the potentially affected parties

Since the scale of the anticipated impacts is low, the low environmental sensitivity of the site (i.e. used for grazing and crop production, with surrounding mining areas) and the fact that no conflict was foreseen between potentially affected parties, no additional public participation mechanisms were considered at this stage of the process. The following actions have already been taken:

- Newspaper advertisement

  Since the proposed development is unlikely to result in any impacts that extend beyond the municipal area where it is located, it was deemed sufficient to advertise in a local newspaper. An advertisement was placed in English in the local newspaper (Klerksdorp Rekord) on the 22 July 2022 (see Appendix C1) notifying the public of the BA process and requesting Interested and Affected Parties (I&APs) to register with, and submit their comments to Environamics Environmental Consultants. I&APs were given the opportunity to raise comments within 30-days from the placement of the advertisement.

- Site notices

  Site notices were placed on site in English and Afrikaans on 21 July 2022 to inform surrounding communities and immediately adjacent landowners of the proposed development. Photographic evidence of the site notices is included in Appendix C2.

- Direct notification of identified I&APs

  Identified and registered I&APs, including key stakeholders representing various sectors, were directly informed of the Basic Assessment process via telephone calls, WhatsApps and emails (as appropriate). See Appendix C3 to this report. A Background Information Document and Locality Map was also distributed to the I&APs. Distribution of the notification was on 25 August 2022.

- Direct notification of surrounding landowners and occupiers

  Written notices were provided via WhatsApp or email to all surrounding landowners and occupiers – refer to Figure 5.7. The surrounding landowners were given the opportunity to raise comments within 30 days. A Background Information Document and Locality Map

was also distributed to the I&APs. Distribution of the notification was on 25 August 2022. For a list of surrounding landowners see Appendix C3.

- Circulation of Draft Basic Assessment Report

  The registered I&APs have been notified of the availability of the draft BAR at the commencement of the 30-day review and comment period. This included the details of where the report can be accessed. They have been requested to provide their comments on the report within 30 days (27 January 2023 – 27 February 2023). All issues that are identified, raised and recorded will be documented and compiled into a Comments and Responses Report (Appendix C6) and included as part of the Final Basic Assessment Report.

  As part of the distribution of the draft Basic Assessment Report, a non-technical summary has also been distributed to the I&APs and included in this draft Report. Refer to Appendix G.

- Circulation of decision and submission of appeals:

  Notice will be given to all identified and registered I&APs of the decision taken by the DFFE. The attention of all registered I&APs will also be drawn to the fact that an appeal may be lodged against the decision in terms of the National Appeals Regulations. In accordance with the provisions of Regulation 4(1) of Government Notice No. 993, an appellant must submit the appeal to the appeal administrator, and a copy of the appeal to the applicant, any registered I&APs and any organ of state with interest in the matter within 20 days from the date that the notification of the decision was sent to the applicant by the competent authority.

5.2.2 Registered I&APs

I&APs include all stakeholders who deem themselves affected by the proposed activity. According to Regulation 43(1) "*A registered interested and affected party is entitled to comment, in writing, on all reports or plans submitted to such party during the public participation process contemplated in these Regulations and to bring to the attention of the proponent or applicant any issues which that party believes may be of significance to the consideration of the application, provided that the interested and affected party discloses any direct business, financial, personal or other interest which that party may have in the approval or refusal of the application*."

This report is the Draft Basic Assessment Report which has been made available to all potential and/or registered I&APs and State Departments. They have been provided with a copy of the Draft BAR and have been requested to provide written comments on the report within 30 days. All issues identified during this review period will be documented and compiled into a Comments and Response Report to be included as part of the Final BAR (Appendix C6).

All comments received prior to the release of the Draft BAR for the 30-day review and comment period have been included in this report as Appendix C5 and Appendix C6 to provide I&APs an opportunity to confirm that their comments raised during the initial public participation phase have been included and considered.

5.2.3 Issues raised by I&APs and consultation bodies

To date comments have been received and are captured and responded to in the Comments and Response Report included in Appendix C6. Any comments received during the circulation of the Draft BAR will be summarised in the Final BAR. The full wording and original correspondence are included in Appendix C5 and Appendix C6.

A Public Meeting will be arranged and held during the 30-day review and comment period of the draft Basic Assessment Report. Details of the meeting and comments raised during the meeting will be documented and included in the final Basic Assessment Report.

5.2.4 Consultation process

Regulation 41 requires that the landowner, surrounding landowners, municipality, relevant ward councillor, any organ of state having jurisdiction in respect of any aspect of the activity and any other party as required by the competent authority should be given written notice of the activity. A complete list of all the consultees who received written notice as well as proof of correspondence is attached as Appendices C.

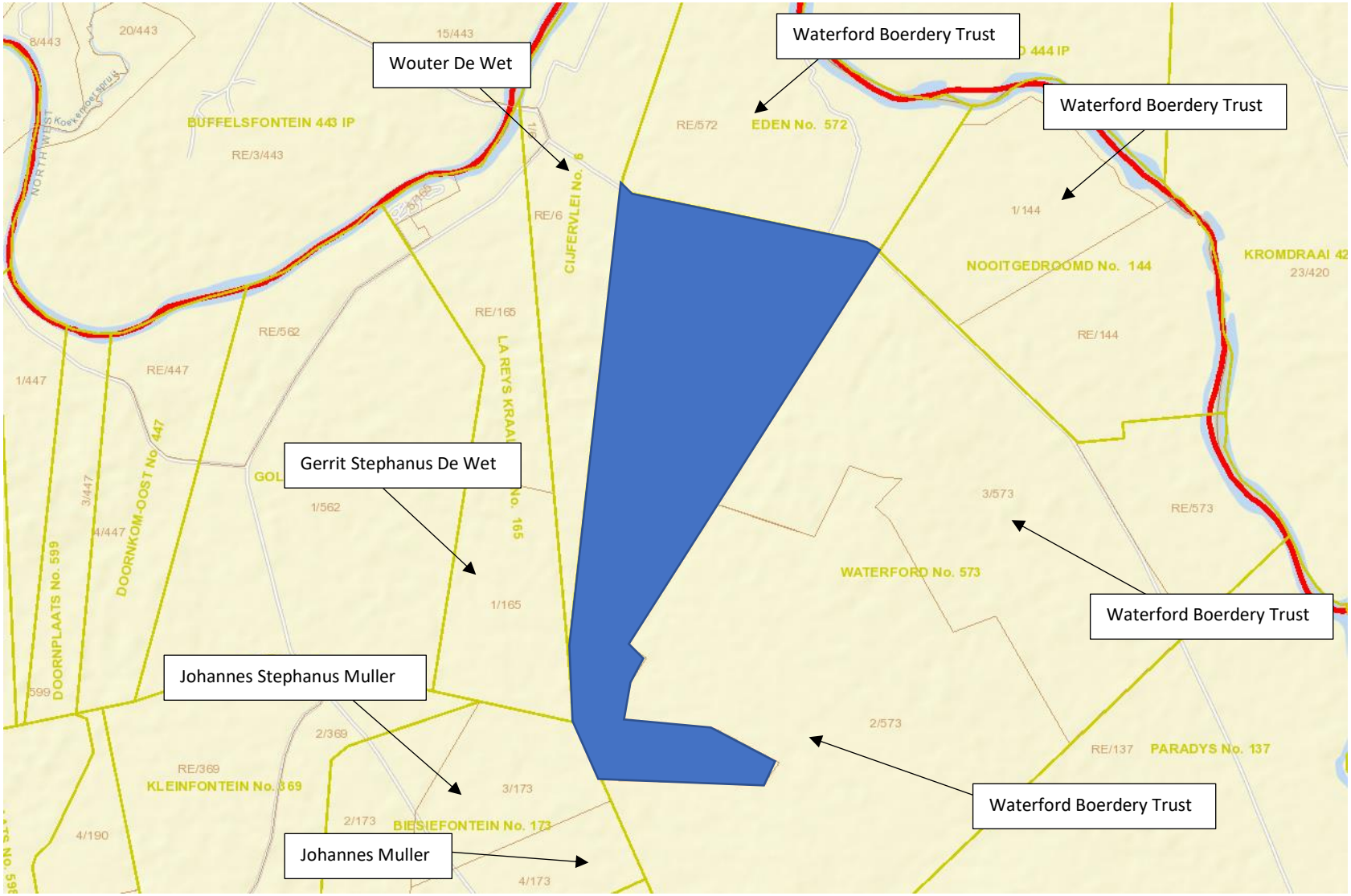


Figure 5.7: Surrounding Landowners (blue polygon = Portion 1 of the Farm Waterform No. 573

5.3 THE ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE PREFERRED ALTERNATIVE

The following sections provide general information on the biophysical and socio-economic attributed associated with the preferred location alternative.

5.3.1 Biophysical environment

The biophysical environment is described with specific reference to geology, soils, agricultural potential and land capability, vegetation and landscape features, climate, biodiversity, heritage features (in terms of archaeology and palaeontology), the visual landscape and the social environment to be affected. A number of specialists were consulted to assist with the compilation of this chapter of the report – refer to the Table 1.2.

However, due to the fact that the area proposed for development (i.e. the development footprint) exclusively consists of land used for agricultural activities, limited sensitive areas from an ecological or conservation point have been identified. The details of the environmental features present within the site are discussed in detail below.

5.3.1.1 Geology, soils and terrain

According to the Soil and Agriculture Impact Assessment (attached in Appendix D4) the site is characterised by the Bc 25 and Bd 13 land types. The Bc land type is characterised with Hutton, Rensburg, Willowbrook and Mispah soil forms according to the Soil classification working group, with other associated soil forms and rocky areas also occur in the terrains. The Bd 13 land type is commonly dominated with Clovelly, Avalon, Kroonstad, Katspruit and Willowbrook soil forms within the terrain landscapes. The Bc and Bb land types are characterised by plinthic catena with upland duplex and margalitic soils being rare within the terrain. The terrains are characterised by eutrophic soil base status. In the Bc land types, red soils are widespread and in the Bd land types they are limited.

Specific soil horizons and diagnostic profiles have been identified for the site. Soil profiles were studied up to a depth of 1.2 m to identify specific diagnostic horizons which are vital in the soil classification process as well as determining the agricultural potential and land capability. The most sensitive soil forms have been considered. The following diagnostic horizons were identified during the site assessment (refer to Figure 5.8):

- Orthic topsoil - Orthic topsoil are mineral horizons that have been exposed to biological activities and varying intensities of mineral weathering. The climatic conditions and parent material ensure a wide range of properties differing from one Orthic A topsoil to another (i.e., colouration, structure etc).
- Lithic horizon - A lithic horizon is a subsurface horizon with morphological expression of pedogenic alteration that range from strong weathering of the underlying country rock, with friable soil-like structure. The soil material is intimately mixed with partially weathered to hard rock fragments. Evidence of gleying in the form of reduction of iron minerals in the soil matrix or in the partially weathered fragments may be present in the wetter variants. However, redo-morphological properties are absent in drier conditions.
- Hard rock horizon - Hard rock horizon comprises of hard rock characterised with primarily physical weathering ranging from fractured and solid rock lacking soil development

between the fractures. The underlain parent material includes igneous, sedimentary and metamorphic rocks. The horizon restricts most root penetrations of plants except for some selected annual trees and shrubs which can grow through the fractured sections in specialized ecological niche environments.

- Yellow-Brown apedal - The yellow-brown apedal horizon is similar to that of the Red Apedal horizon in all aspects except for the colour and the iron-oxide processes involved with the colouration thereof. This diagnostic soil horizon rarely occurs in parent rock high in iron-oxides and will rather be associated with Quartzite, Sandstone, Shale and Granites.
- Albic horizon - Albic horizons are characterised with uniform colours due to the dominance of grey to whitish colouration of clay particles. These colours form because of the exposed quartz particles that usually range from a whitish to pale yellow colouration. Albic horizons mostly have a sand to sandy loam texture. Some can also have the occurrence of sandy clay loam and finer textures. The prominent characteristic of an albic horizon is the soil matrix bleaching. This feature occurs due to the redox and ferrolysis chemical reactions, due to eluviation and in instancse from podzolization. This horizon has been traditionally identified by a loss of colloidal material, silicate clay, sesquioxide and humus with low clay contents. Most albic horizons have more clay contents than the overlying topsoil horizons. Albic horizons can also occur at deeper layers and receive lateral flows of water from hillslope water accumulations expected.
- Soft Plinthic Horizon - The accumulations of iron (and in some cases manganese) as hydroxides and oxides with the presence of high chroma striations and concretions with black matrixes are associated with the Soft Plinthic horizon. This diagnostic horizon forms due to fluctuating levels of saturation. The iron and manganese concentration result in soft marks within the soil matrix which transform in concretions with high consistencies. According to Soil Classification Working Group (2018), this horizon commonly occurs as a result of hillslope hydrology in flat, sandy landscapes. This horizon is known to have an apedal structure together with the presence of concretions.
- Gley Horizon - Gley horizons are well developed and have homogenous dark to light grey colours with smooth transitions. Stagnant and reduced water over long periods is the main factor responsible for the formation of a Gley horizon and could be characterised by green or blue tinges due to the presence of a mineral called Fougerite which includes sulphate and carbonate complexes. Even though grey colours are dominant, yellow and/or red striations can be noticed throughout a gley horizon. The structure of a gley horizon mostly is characterised as strong apedal, with low hydraulic conductivities and a clay texture, although sandy gley horizons are known to occur. The gley soil form commonly occurs at the toe of hillslopes (or benches) where lateral water inputs (sub-surface) are dominant and the underlaying geology is characterised by a low hydraulic conductivity. The gley horizon usually is second in diagnostic sequence in shallow profiles yet is known to be lower down in sequence and at greater depths.

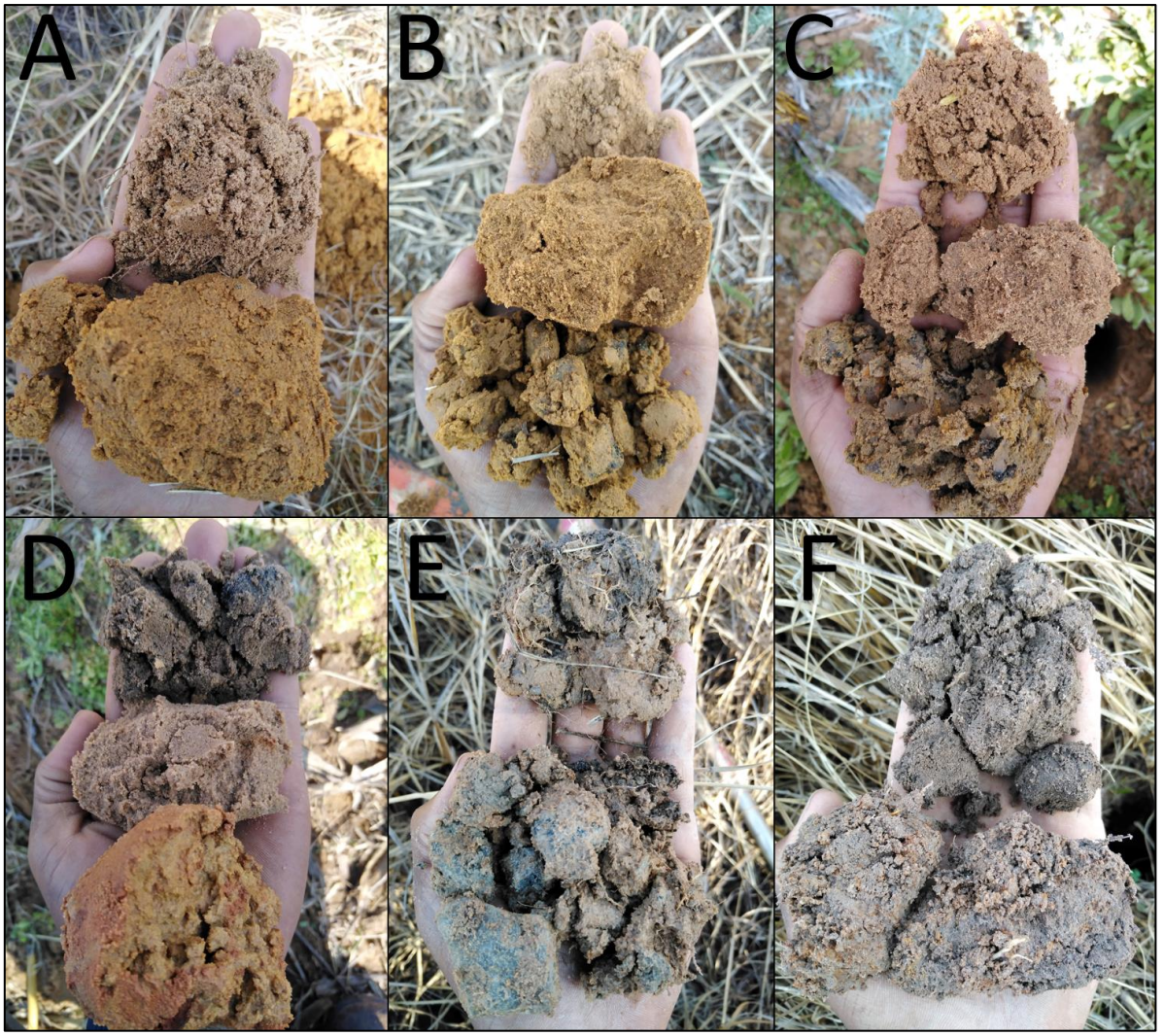


Figure 5.8: Dominant soils identified during the site assessment. A) Orthic topsoil with a Yellow-Brown apedal horizon below. B) Lithic below Yellow-brown apedal horizon C) Soft plinthic horizon D&F) Gleyic horizons E) Lithic subsurface horizon.

The slope percentage of the site has been calculated. Most of the site is characterised by a slope percentage between 0 and 4%, with some smaller patches characterised by a slope percentage ranging from 5 to 11%. There are a few irregularities in the topography in scattered areas, however the majority of the area is characterised by a gentle slope. The Digital Elevation Model of the site indicates an elevation of 1 233 to 1 359 Metres Above Sea Level (MASL).

The Palaeontological Impact Assessment (Appendix D6) indicates that the grid connection alternatives are underlain by Quaternary sands and the Vryheid Formation (Ecca Group, Karoo Supergroup), while the northern portion is underlain by the Hekpoort and Stubenkop Formations of the Pretoria Group (Transvaal Supergroup). The Pretoria Group sedimentary rocks in and near the study area are extensively intruded, and locally metamorphosed, by sills of diabase. The diabase has no palaeontological significance. However, the existence of the diabase rocks would have had a thermal metamorphic effect on nearby sediments and would decrease the chance of fossil preservation. According to the PalaeoMap of the South African Heritage Resources Information System (SAHRIS) the Palaeontological Sensitivity of the Quaternary soils and Hekpoort Formations are moderate while the Vryheid Formation has a Very high Palaeontological Sensitivity and the Stubenkop Formation a Low Sensitivity while the diabase has a Zero Sensitivity (Almond et al, 2013; SAHRIS website).

5.3.1.2 Agricultural potential, land capability, erosion potential and existing agricultural activities

The Soil and Agricultural Impact Assessment (Appendix D4) indicates that agricultural potential is determined by a combination of soil, terrain and climate features. Land capability classes reflect the most intensive long-term use of land under rain-fed conditions. The land capability is determined by the physical features of the landscape including the soils present. The land potential or agricultural potential is determined by combining the land capability results and the climate capability for the region.

In terms of the climate capability, the capability has been determined as “C8” for the project area. The limitation rating is listed as “Very Severed” which indicates that the area is very severely restricted in terms of the choice of crops due to heat and moisture stress. Suitable crops at high risk of yield loss.

When considering the land capability of the area, the most sensitive soil forms associated with the site are restricted to land capability 3 and 4 classes. Class 3 refers to moderate limitations, with some erosion hazard. This class is listed as arable. Class 4 refers to severe limitations and low arable potential. This class is also listed as arable.

From the two land capability classes, the land potential levels have been determined by means of the Guy and Smith (1998) methodology. Land capability III and IV have been reduced to a land potential level L6 due to climatic limitations. Land Potential L6 refers to very restricted potential, with regular and/or severe limitations due to soil, slope, temperatures or rainfall. This rating refers to non-arable land.

Furthermore, the Soil and Agricultural Impact Assessment (Appendix D4) indicates the erosion potential associated with the site. The following ratings are indicated for the identified soil forms:

- Ermelo: Moderate potential for soil erosion

- Clovelly: Moderate potential for soil erosion
- Avalon: Moderate potential for soil erosion
- Carolina: Moderate potential for soil erosion
- Kransfontein: Moderate potential for soil erosion
- Glenrosa: High potential for soil erosion
- Mispah: Very High potential for soil erosion
- Pinedene: Moderate potential for soil erosion
- Katspruit: High potential for soil erosion

The Soil and Agricultural Impact Assessment (Appendix D4) has also considered and addressed the site sensitivity of the site in terms of the DFFE Screening Tool Report (Appendix B).

Fifteen land capabilities have been digitised by (DAFF, 2017) across South Africa, of which nine potential land capability classes are located within the site, including;

- Land Capability 1 to 5 (Very Low to Low Sensitivity);
- Land Capability 6 to 8 (Low/Moderate to Moderate Sensitivity) and;
- Land Capability 9 to 10 (Moderate High Sensitivity).

The land capability sensitivity (DAFF, 2017) indicates a range of sensitivities expected throughout the project focus area, which is predominantly covers “Moderately Low” to “Moderate” sensitivities. Smaller patches are characterised by sensitivities with “Very Low to Low” and “Moderately High” (Figure 5.9).

Furthermore, various crop field boundaries were identified by means of the DEA Screening Tool (Appendix B), which are predominantly characterised by “High” sensitivities. All crop fields identified as "high" sensitivities in Figure 5.10 have not been used by the landowner for several years due to the limited capabilities. These abandoned areas were previously used for maize fields and grazing. The sandy soils observed on site indicated drainage and waterlogging problems which can either be caused by shallow soil profile depths or occurrence of a restrictive substratum layer below. The Land Capability Sensitivity map below (see Figure 5.9) shows that most "crop fields" (now abandoned) are within low to moderate capability sensitivity areas.

It is the specialist`s opinion and recommendation that development can occur on these areas for the project. The productivity and crop feasibility of these areas as determined by an Agricultural Economic Specialist assessment (Appendix D9) also confirms that they have a low productive potential. Furthermore, since the applicant has obtained consent from the landowners for use of these farm areas, these can be submitted as part of the supporting documents for the application. Therefore, no stakeholder engagement will be required for compensation of these crop fields. It is therefore the specialist` recommendation that, the Naos Solar PV Project One be favourably considered as proposed.

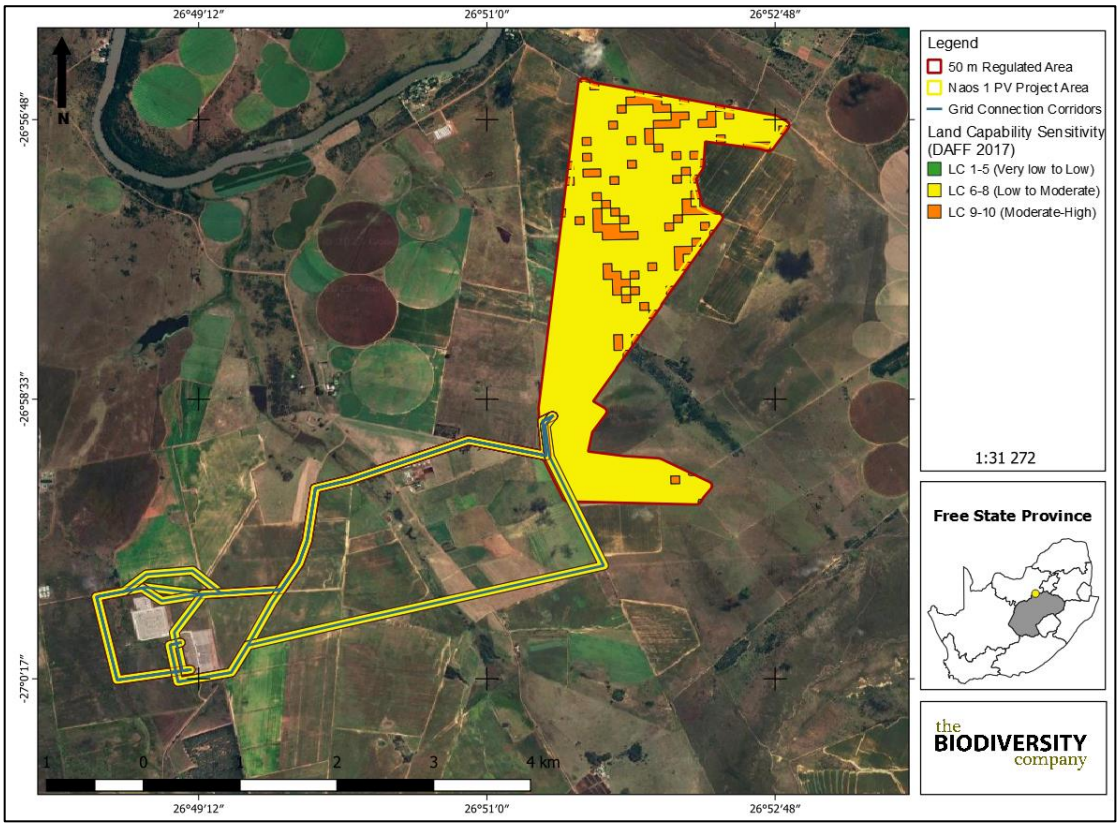


Figure 5.9: Land capability sensitivity associated with Naos Solar PV Project One

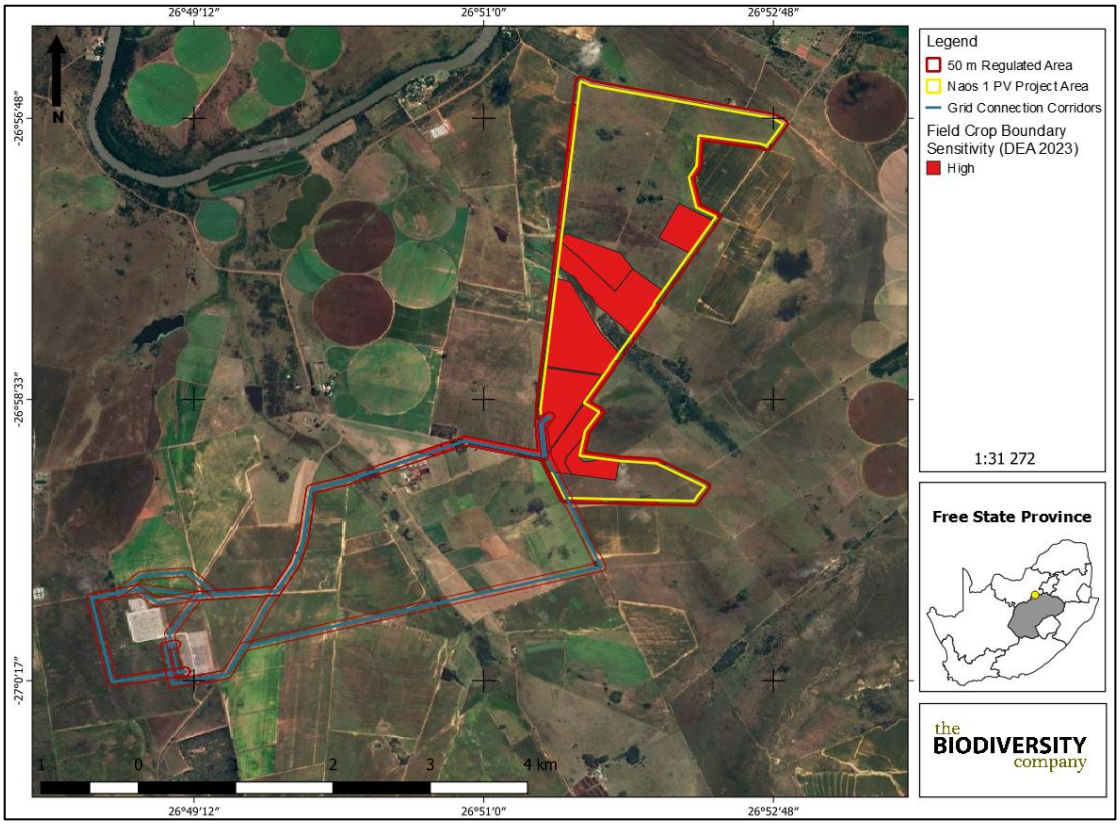


Figure 5.10: Crop boundary sensitivity associated with Naos Solar PV Project One, as per the DFFE Screening Tool Report

Due to the location of the site within areas which are under crop production, or have historically been under crop production, an Agricultural Economic Assessment (Appendix D9) has been undertaken. The approach adopted for the assessment was to consider the agricultural potential of the grain fields as well as the carrying capacity of the veld and calculate the potential income from the fields and also look at the potential other farming income after the implementation of Naos Solar PV Project One. This assessment also responds to the feedback received from the Free State Department of Agriculture and Rural Development (DARD) following receipt of the Notification of the Basic Assessment Process which indicated that the proposed development is unsupported within the site as infringement on high potential agricultural land would occur.

This report confirms that the Farm Waterford No. 573 consists of 155 hectares grain fields and 651 hectares planted pasture and natural veld. The report also confirms that this is a well-managed farm and good farming practices are applied to optimise the yield of the farm. The farm is also planned correctly and planned fences are in place.

The physical soil maps indicated that the long-term maize yield is 3.25 ton/ha and the caring capacity of the veld is 7 hectares per Large Stock Unit.

At the current grain prices and the current inputs at a yield of 3,35 ton, it is very difficult to make a profit. Even at an 80% calf percentage, the profits per livestock unit is low but it is still positive.

Discussions were held with the farmers which indicated that they still want to better the production of the farm by adding a solar energy facility and building a new irrigation dam that will be filled with water pumped from the Vaal River and using gravitation to irrigate the planned fields.

With the development of the new Naos Solar PV Project One, there will be new farming opportunities. The development of the solar facility makes it possible to harvest rainwater and to use this rainwater for irrigation. The second option is to start a sheep enterprise within the boundaries of the solar facility. The sheep enterprise will also double the income for the livestock enterprise because it is a fact that the sheep income is normally double that of a weaner calf system.

If the 155 hectares crop field is used only 34% of the rainwater harvested on this field will be enough to produce the same amount of maize as on the 155-hectare dryland. An irrigation unit of 35 hectare is needed to produce the same amount of grain but at a profit. This plan of rainwater harvesting will fit into the long-term planning of the landowners. If the harvested rainfall is used to plant organic vegetables the income per hectare will be much higher and there will be extra work opportunities created.

With the current situation (i.e. avoidance of crop areas), work opportunities are going to be lost. The grain fields will be converted to planted pastures and the livestock enterprise will be expanded without the creation of extra work opportunities.

If the assumption is made that the 155 cultivated hectares will support two workers the 35-hectare irrigation maize will replace the job opportunity for these workers. For vegetable production every 5 hectares will support 1 work opportunity. With the known increased income from the vegetables, the farmers can support the extra work opportunities. This

means that the irrigation portion with vegetables will create an extra 5 permanent jobs. Sheep production is also more labour-intensive than cattle production. Sheep farming makes use of double the workers than that of a cattle farm, so it can be expected that an extra 2 jobs will be created. These job opportunities don't include the permanent jobs that Naos Solar PV Project One is expected to create.

The specialist has indicated that Naos solar PV Project One will be an asset for the agricultural sector rather than an overall liability and therefore should be considered favourably or supported by the Free State Department of Agriculture and Rural Development. Further comment and feedback has been sought from the Free State Department of Agriculture and Rural Development and will be included in the Final Basic Assessment Report, if obtained.

5.3.1.3 Vegetation and landscape features

The site is located within the Middle Vaal Water Management Area (WMA) and entirely within the Highveld ecoregion. The topography of the general area is characterised by slightly undulating plains with wetlands and / or drainage channels bisecting the broader area. The Vaal River is located directly to the north of the site.

Most properties situated within a 500m radius of the proposed project are being used for livestock and crop cultivation. The proposed development land is used for livestock farming and crop cultivation at present. Furthermore, the site is surrounded by agricultural areas in, mining areas in the north and west and the Vaal River in the north thus little connectivity with natural areas are generally present within the landscape.

The site is situated in the Grassland biome, which is characterised by herbaceous vegetation of relatively short and simple structure that is dominated by graminoids, usually of the family Poaceae. Woody plants are rare (usually low to medium-sized shrubs) or absent or are confined to specific habitats, such as smaller escarpments or koppies. Core grassland areas usually have deep, fertile soils although a wide spectrum of soil types occurs. Precipitation is strongly seasonal, and the growing season lasts approximately half the year.

The site overlaps the Vaal-Vet Sandy Grassland and Rand Highland Grassland vegetation units (Figure 5.11). The Vaal-Vet Sandy Grassland vegetation unit is described as plains-dominated landscape with some scattered slightly irregular undulating plains and hills. Mainly low tussock grasslands with an abundant karroid element occur. *Themeda triandra* is dominant in this vegetation unit. The conservation status of this vegetation unit is **Endangered**.

The Rand Highland Grassland vegetation unit is described as a highly variable landscape with extensive sloping plains and a series of ridges slightly elevated over undulating surrounding plains. The vegetation is species-rich, wiry, sour grassland alternating with low, sour shrubland on rocky outcrops and steeper slopes. Most common grasses on the plains belong to the genera *Themeda, Eragrostis, Heteropogon* and *Elionurus*. High diversity of herbs, many of which belong to the family Asteraceae, is also a typical feature. Rocky hills and ridges carry sparse (savannoid) woodlands with *Protea caffra subsp. caffra, P. welwitschii, Senegalia caffra* and *Celtis africana*, accompanied by a rich suite of shrubs among which the genus *Searsia* (especially *S. magalismonata*) is most prominent. The conservation status of this vegetation unit is **Vulnerable.**

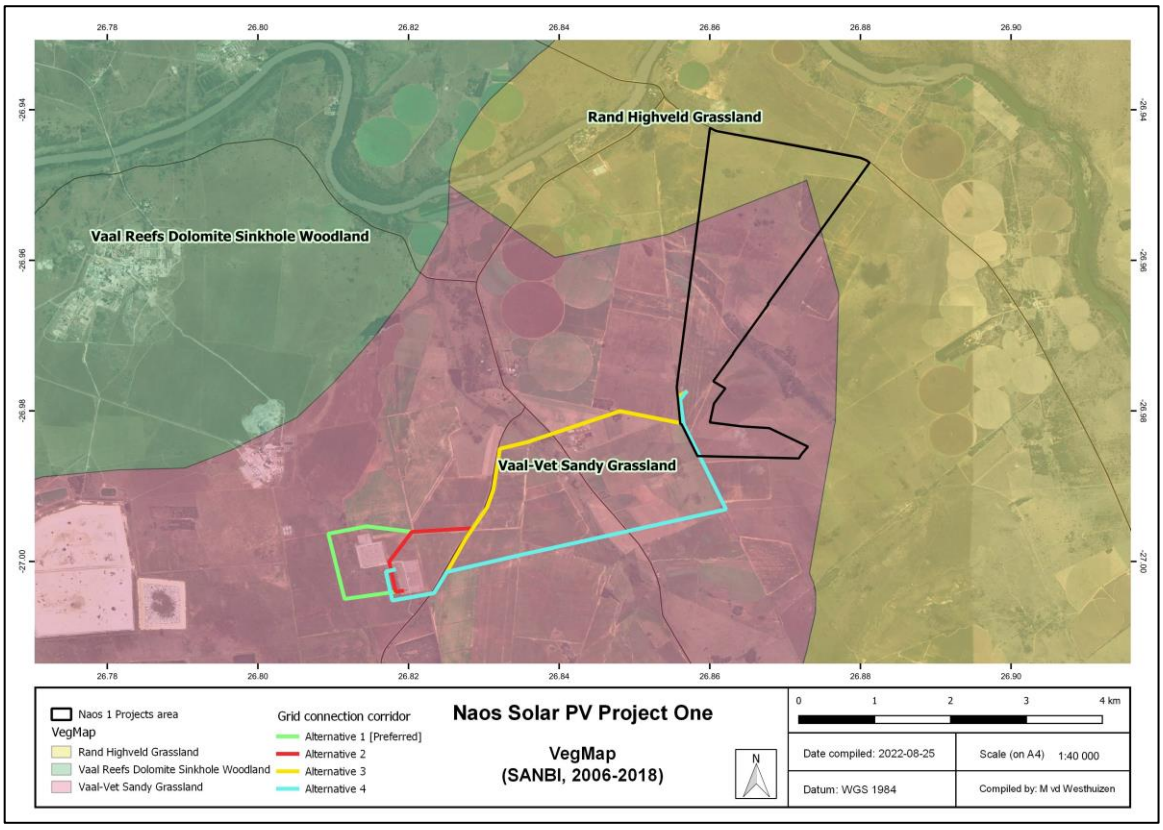


Figure 5.11: Approximate location of the project within the Vaal-Vet Sandy Grassland (Endangered) and the Rand Highveld Grassland (Vulnerable) vegetation types

Vegetation Units:

Vegetation units have been identified according to soil characteristics, topography and land-use within the site. Twelve distinct units have been identified through a vegetation survey undertaken, including the alternative grid connection corridors (Figure 5.12 and Table 5.1). The units include:

1. *Themeda triandra – Schizachyrium sanguineum* sandy grassland;
2. *Seriphium plumosum - Cynodon dactylon* sandy grassland;
3. *Eleusine coracana* grassland;
4. *Cynodon dactylon - Panicum schinzii* grassland
5. Wetlands
6. *Vachellia karroo – Asparagus laricinus* woodland;
7. *Eucalyptus camaldulensis* woodland;
8. Remains of *Eucalyptus camaldulensis* woodland;
9. *Digitaria eriantha* planted pastures;
10. Agricultural field;
11. Old agricultural field;
12. Buildings.

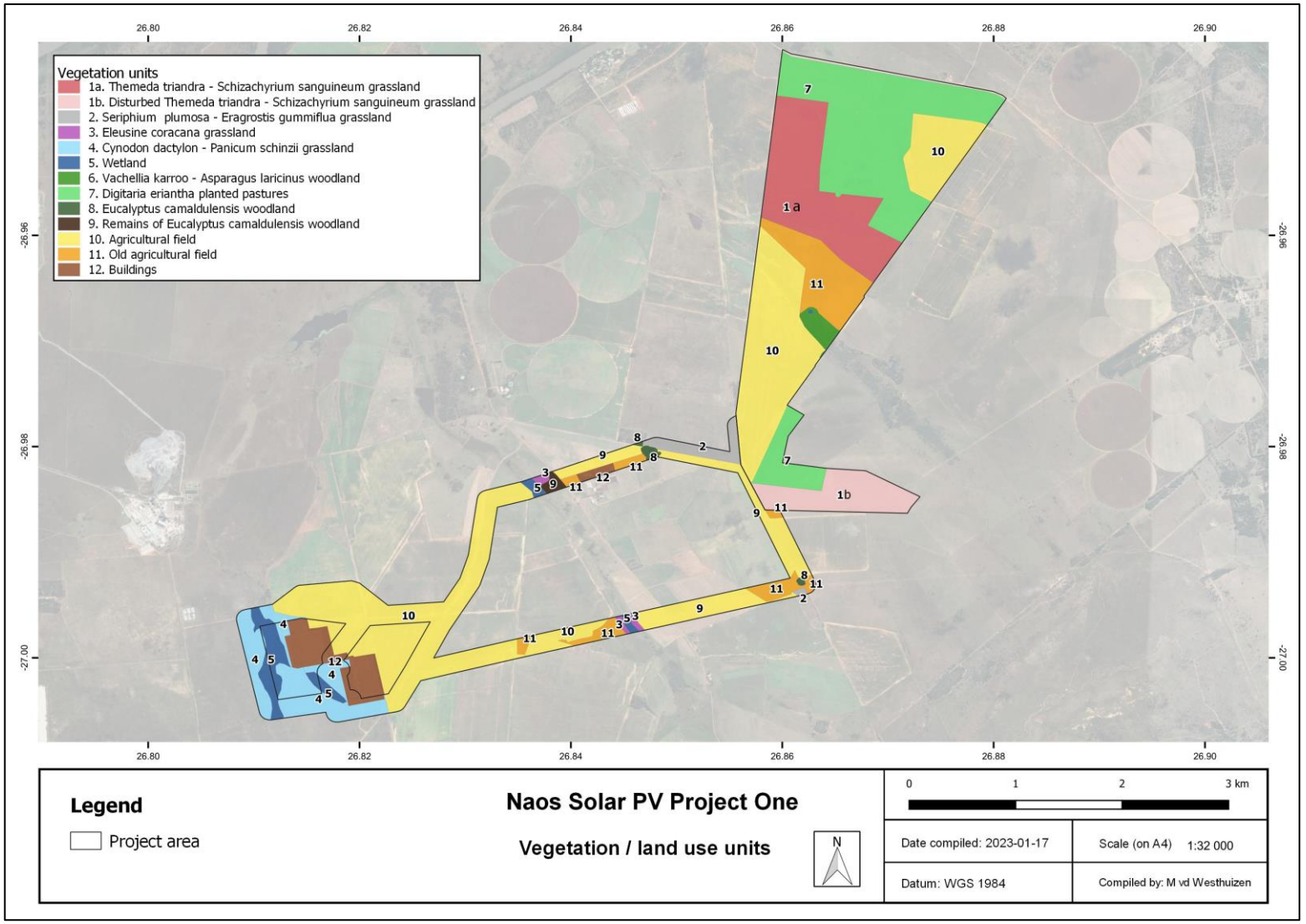


Figure 5.12: Vegetation units present within the Naos Solar PV Project One Site

Table 5.1: Summary of the Vegetation units present at the Naos Solar PV Project One

Vegetation Unit	Description	Botanical Analysis and Characteristics	Photograph
Themeda triandra – Schizachyrium sanguineum sandy grassland (1a) and disturbed *Themeda triandra – Schizachyrium sanguineum* sandy grassland (1b)	• Occurs on sandy plains. • Currently used for cattle grazing. • Consists mostly of grasses and forbs with scattered bush clumps. • It is disturbed to some extent, as can be seen by the presence of *Seriphium plumosa* (Bankrotbos). • The species diversity is high. • The area is in a CBA1, but due to the fact that it is somewhat disturbed, it should rather be considered a CBA2. • Provincially protected plant species are present: *Crinum macowanii, Helichrysum nudifolium, H. rugulosum, H. kraussii, Gladiolus permeabilis subsp. Edulis* and *Boophone disticha*. • No protected tree species were recorded. • Medium-High sensitivity due to a high species diversity, and six provincially protected species present. • Represents the Endangered Vaal-Vet Sandy Grassland vegetation unit. • No protected tree species were recorded. • Some sections (1b) are more disturbed, these sections have a medium sensitivity	• State of the vegetation: Somewhat disturbed, high species diversity • Need for rehabilitation: Medium • Conservation priority: Medium • Soils and geology: Sandy soil • Density of the woody layer: Shrubs and trees: 10 % (avg. height: 1,2m) • Density of herbaceous layer: Grasses: 50% (avg. height: 0,6m) and Forbs: 35% (avg. height: 0,5m) • Sensitivity:Medium-High (1a) and Medium (1b) • Dominant plant species: *Themeda triandra, Digitaria eriantha, Schizachyrium sanguineum, Eragrostis gummiflua, Pollichia campestris, Crabbea acaulis, Gladiolus permeabilis, shrub plumosa, Vachellia karroo, Ziziphus mucronata, Searsia pyroides and Asparagus laricinus* • Red Data Species (NEMBA): None observed • Protected tree species (DFFE): None observed	  *Boophone disticha*

Seriphium plumosum – Cynodon dactylon sandy grassland	• Occurs on sandy plains. • Currently used for cattle grazing. • Consists mostly of grasses and forbs with almost no trees. • Very disturbed, as can be seen by the presence of *Seriphium plumosum* (Bankrotbos) which proliferates in disturbed or overgrazed areas. • The species diversity is low. • The vegetation unit is classified as having a Medium-Low sensitivity since it is very disturbed, due to poor land management practices in the past. • Represents the Endangered Vaal-Vet Sandy Grassland vegetation unit. • No protected tree species or species of conservation concern present. • Four provincially protected plant species were recorded, namely *Aloe greatheadii, Boophone disticha, Helichrysum kraussii* and *Helichrysum nudifolium*.	• State of the vegetation: Very disturbed, low diversity • Conservation priority: Low • Soils and geology: Sandy soil • Density of the woody layer: Shrubs and trees: 1 % (avg. height: 2m) • Density of herbaceous layer: Grasses: 50% (avg. height: 0,8m) and Forbs: 40% (avg. height: 1m) • Sensitivity: Low • Dominant plant species: *Aristida congesta, Cynodon dactylon, Digitaria eriantha, Eragrostis chloromelas, Eragrostis gummiflua, Crotalaria sphaerocarpa subsp. sphaerocarpa, Polydora poskeana, Conyza bonariensis, Tagetes minuta* and *Seriphium plumosum* • Red Data Species (NEMBA): None observed • Protected tree species (DFFE): None observed	
Eleusine coracana grassland	• Occurs next to a valley bottom wetland. • It is dominated by the grass *Eleusine coracana* and other grasses. • There are no trees or shrubs. • It is disturbed and has a low species diversity. • Sensitivity is low.		

Cynodon dactylon - Panicum schinzii grassland	• Located east and south of existing 132/400kV Mercury Main Transmission Substation. • Adjacent to a wetland feature. • Some gravel roads and power lines traverse the grassland. • No grazing occurs and the grass and forb layer is dense and tall. • The development and operation of the substation have disturbed it to some extent. • Soil is sandy to clayey. • No protected trees were recorded. • The vegetation unit is classified as having a Medium sensitivity. • Moderately disturbed. • Represents the Endangered Vaal-Vet Sandy Grassland vegetation unit. • Some provincially protected plant species are present.	• State of the vegetation: Moderately disturbed • Conservation priority: Medium • Soils and geology: Sandy to clayey soil • Density of the woody layer: Shrubs: 5 % (avg. height: 0,8m) • Density of herbaceous layer: Grasses: 80% (avg. height: 1,2m) and Forbs: 30% (avg. height: 0,8m) • Sensitivity: Medium • Dominant plant species: *Cynodon dactylon, Panicum schinzii, Cymbopogon caesius, Pogonarthria squarrosa, Berkheya radula, Verbena bonariensis. Polydora poskeana, Asparagus laricinus and Seriphium plumosum* • Red Data Species (NEMBA): None observed • Protected tree species (DFFE): None observed	
Wetlands	• One exorheic depression wetland (artificial dam) is present in the site. • Two Unchannelled Valley Bottom wetlands present in the grid connection corridor alternatives. • There are two more dams on the adjacent farm portions that have been built in the early 1980's. It would not have had wetland characteristics if it were not for the dams. • The soil is sandy and under natural conditions the soil would not have been saturated for long enough periods to create characteristic wetland soils and vegetation. • The current land use is cattle grazing. • *Cynodon dactylon* is the dominant grass species.	• State of the vegetation: Moderatley disturbed • Conservation priority: High • Soils and geology: Sandy to clayey soil • Density of the woody layer: Shrubs: 0 % • Density of herbaceous layer: Grasses: 80% (avg. height: 1,2m) and Forbs: 20% (avg. height: 0,8m) • Sensitivity: Medium • Dominant plant species: *Phragmites australis, Panicum schinzii, Aristida junciformis, Cyperus species* and *Berkheya radula* • Red Data Species (NEMBA): None observed	

	• One Unchannelled Valley Bottom wetland is located east and south of the 132/400kV Mercury Main Transmission Substation. • Some gravel roads and power lines traverse the wetland. • No grazing occurs and the grass and forb layer is dense and tall. • The 132/400kV Mercury Main Transmission Substation was built partially inside the wetland. • Channels were constructed to drain water into the undisturbed part of the wetland. • Soil is sandy to clayey. • The other Unchannelled Valley Bottom wetland is located around the middle of the grid connection corridor alternatives. • The vegetation associated with these wetlands is dominated by grasses and reeds. • *Phragmites australis* and *Typha capensis* are the dominant reed species present. • Grass species include *Cynodon dactylon, Panicum schinzii, Aristida junciformis, Cymbopogon caesius* and *Setaria sphacelata var. sericea*. • No plant species of conservation concern or protected trees were recorded. • It is moderately disturbed. It represents the Endangered Vaal-Vet Sandy Grassland vegetation unit.	• Protected tree species (DFFE): None observed	Unchannelled Valley Bottom Wetland 
Vachellia karroo– Asparagus laricinus woodland	• Occurs in the central part of the site. • In the rainy season water runs through this area. • It surrounds the depression wetlands. • This vegetation unit is somewhat disturbed. • The *Vachellia karroo– Asparagus laricinus* woodland is very dense, with tall grasses.	• State of the vegetation: Disturbed, very dense • Need for rehabilitation: Low • Conservation priority: Medium-high • Soils and geology: Sandy soil • Density of the woody layer: Shrubs and trees: 80 % (avg. height: 2,5)	-

	• One plant species of conservation concern is present in this vegetation unit, namely *Crinum bulbispermum*, which is in the declining category and also provincially protected. • No protected trees were recorded. • This vegetation unit is no longer in a natural condition as three artificial dams were constructed. • This has however happened about 40 years ago, and some wetland species has settled here. It has created habitat for certain specialist wetland species and also large trees for roosting of avifauna. • One plant species of conservation concern and no protected trees were recorded. • Medium-high sensitivity.	• Density of herbaceous layer: Grasses: 40% (avg. height: 1,5m) and Forbs: 15% (avg. height: 0,5m) • Sensitivity: Medium-High • Dominant plant species: Woodland: *Vachellia karroo, Ziziphus mucronata, Asparagus laricinus, Panicum maximum, Urochloa mosambicensis, Digitaria eriantha, Cynodon dactylon, Tagetes minuta and Berkheya radula;* Dams: *Persicaria decipiens, sedges, Cynodon dactylon*, and *Eragrostis chloromelas.* • Red Data Species (NEMBA): *Crinum bulbispermum* (declining) • Protected tree species (DFFE): None observed	
Digitaria eriantha planted pastures	• A large part of the site, especially to the north, is planted pastures. • The soil is sandy with few rocks. • It was planted with *Digitaria eriantha* (common finger grass) which completely dominates this vegetation unit. *Digitaria eriantha* is one of the dominant indigenous grasses in the greater area. • Most of these planted pastures have not been cultivated recently and therefore several other species are also found there. • Species diversity is low. • Species present are mostly species which is associated with disturbance. • Some provincially protected plant species are present in this vegetation unit, namely *Helichrysum nudifolium*, and *Helichrysum rugulosum*. • No protected trees were recorded.	• State of the vegetation: planted pastures • Need for rehabilitation: Low • Conservation priority: Low • Soils and geology: Sandy Soils • Density of the woody layer: Shrubs: 15 % (avg. height: 0,8m) • Density of herbaceous layer: Grasses: 70% (avg. height: 0,6m) and Forbs: 15% (avg. height: 0,5m) • Sensitivity: Low • Dominant plant species: *Digitaria eriantha, Eragrostis chloromelas, Eragrostis lehmanniana, Selago densiflora, Crotalaria sphaerocarpa, Pentarrhinum insipidum, Seriphium plumosa* and *Asparagus laricinus.* • Red Data Species (NEMBA): None observed • Protected tree species (DFFE): None observed	

	• Low sensitivity due to the fact that it is planted pastures with a low species diversity. • Represents the Endangered Vaal-Vet Sandy Grassland vegetation unit.		
Eucalyptus camaldulensis woodland	• Next to the *Vachellia karroo– Asparagus laricinus* woodland, there is a section covered in *Eucalyptus camaldulensis* (Red gum) trees. • *Eucalyptus camaldulensis* is a category 1b declared invader in the grassland biome. • Low sensitivity due to the fact that it is completely disturbed and consists of a declared invader species.	• State of the vegetation: Very disturbed • Conservation priority: Low • Soils and geology: Sandy soils • Density of the woody layer: Shrubs and trees: 50 % (avg. height: 8m) • Density of herbaceous layer: Grasses: 40% (avg. height: 0,8m) and Forbs: 30% (avg. height: 0,5m) • Sensitivity: Low • Dominant plant species: *Eucalyptus camaldulensis, Cynodon dactylon, Eragrostis gummiflua, Aristida congesta, Asparagus laricinus, Bidens bipinnata and Polydora poskeana* • Red Data Species (NEMBA): None observed • Protected tree species (DFFE): None observed	
Remains of *Eucalyptus camaldulensis* woodland	• This *Eucalyptus camaldulensis* patch is located in a section of the proposed grid connection corridor alternatives and has recently been felled. • The species diversity and sensitivity are low.		

Agricultural field	• There are several agricultural fields in the site planted with maize and lucerne. • There is very little indigenous vegetation left in these fields. • The species diversity is very low and the sensitivity is also low.	
Old agricultural field	• There are some sections that were cultivated in the past. • The natural vegetation has recovered to some extent in these areas, the species diversity is however still low, and the sensitivity is also low.	
Buildings	• This area has little vegetation and therefore has low sensitivity.	

Protected Areas, Critical Biodiversity Areas (CBA) and Ecological Support Areas (ESA)

Officially protected areas, either Provincially or Nationally that occur close to a project site could have consequences as far as impacts on these areas are concerned.

The National Protected Area Expansion Strategy (NPAES) sets targets for protected area expansion, provides maps of the most important areas for protected area expansion, and makes recommendations on mechanisms for protected area expansion. The site is located within a priority focus area of the National Protected Area Expansion Strategy (NPAES).

The project is located within 5km of two protected areas in terms of NEMPAA, known as Mispha Game Farm located approximately 1.8km west of the PV site and 530m west of the grid connection corridors and the Bushbaby Private Nature Reserve located approximately 1.45 km northeast of the proposed development. Refer to Figure 5.13.

However, when consider the location of the Mispah Game Farm, it is clear that it is located on a mining area of Harmony Gold, which include mining infrastructure and tailing dams (Figure 5.14). It has however been confirmed by the Acting Director: Biodiversity Management and Conservation of the Free State Department of Economic, Small Business Development, Tourism and Environmental Affairs (DESTEA) that the Farm Mispah 294 is a declared Protected area (GN 23 of 2001) and that no request for withdrawal of declaration has been received in this regard and the declaration therefore stands.

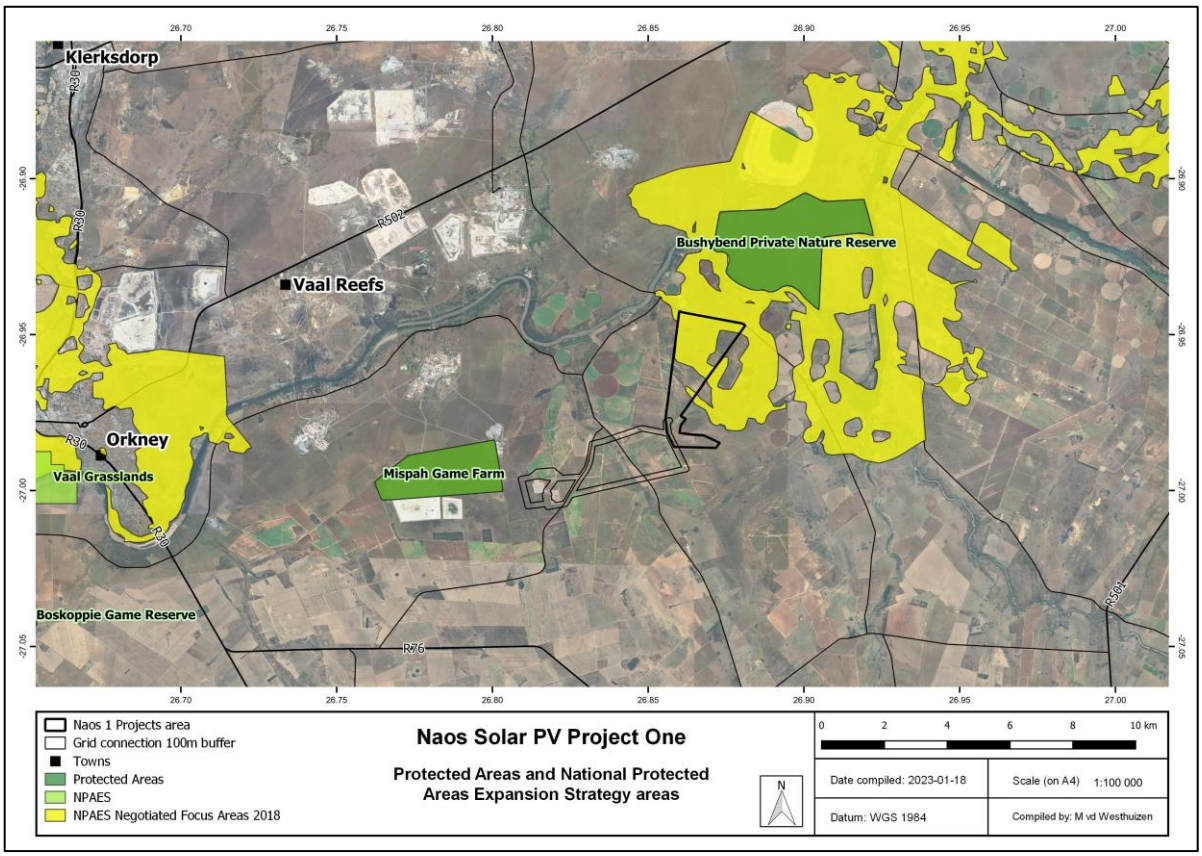


Figure 5.13: Naos Solar PV Project One in relation to the Mispah Game Farm Protected Area and Bushybend Private Nature Reserve, as listed in SAPAD.

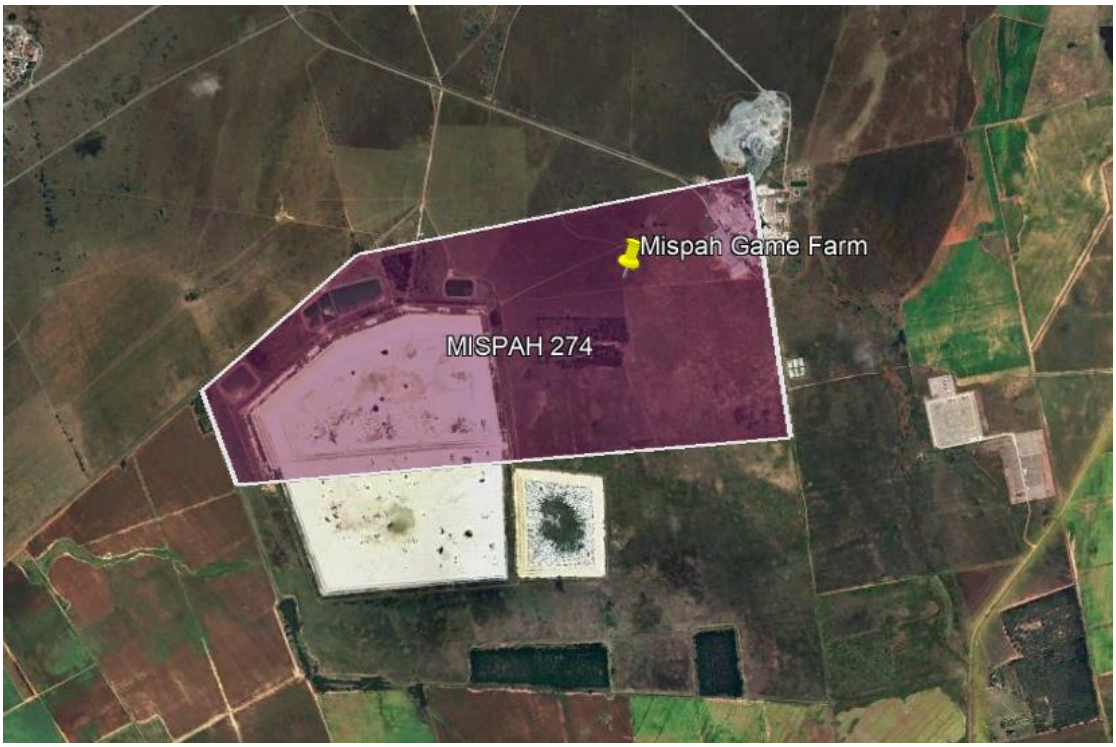


Figure 5.14: The current condition of the property associated with the Mispah Game Farm Protected Area, as listed in SAPAD.

The Free State Biodiversity Conservation Plan has been considered for the identification of the relevant Critical Biodiversity Areas associated with the proposed development.

Critical Biodiversity Areas (CBA) are areas required to meet biodiversity targets for ecosystems, species and ecological processes, as identified in a systematic biodiversity plan. Ecological Support Areas (ESA) are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning of Critical Biodiversity Areas and/or in delivering ecosystem services. Critical Biodiversity Areas and Ecological Support Areas may be terrestrial or aquatic.

The primary purpose of a map of Critical Biodiversity Areas(CBA) and Ecological Support Areas (ESA) is to guide decision-making about where best to locate a development. It should inform land-use planning, environmental assessment and authorisations, and natural resource management, by a range of sectors whose policies and decisions impact on biodiversity. It is the biodiversity sector's input into multi-sectoral planning and decision-making processes.

The site is located within CBA1, ESA1, ESA2, degraded and other. This is relevant to both the PV site and the grid connection corridor alternatives. The CBA 1 are is located within the northern section of the site.

Refer to Figure 5.15.

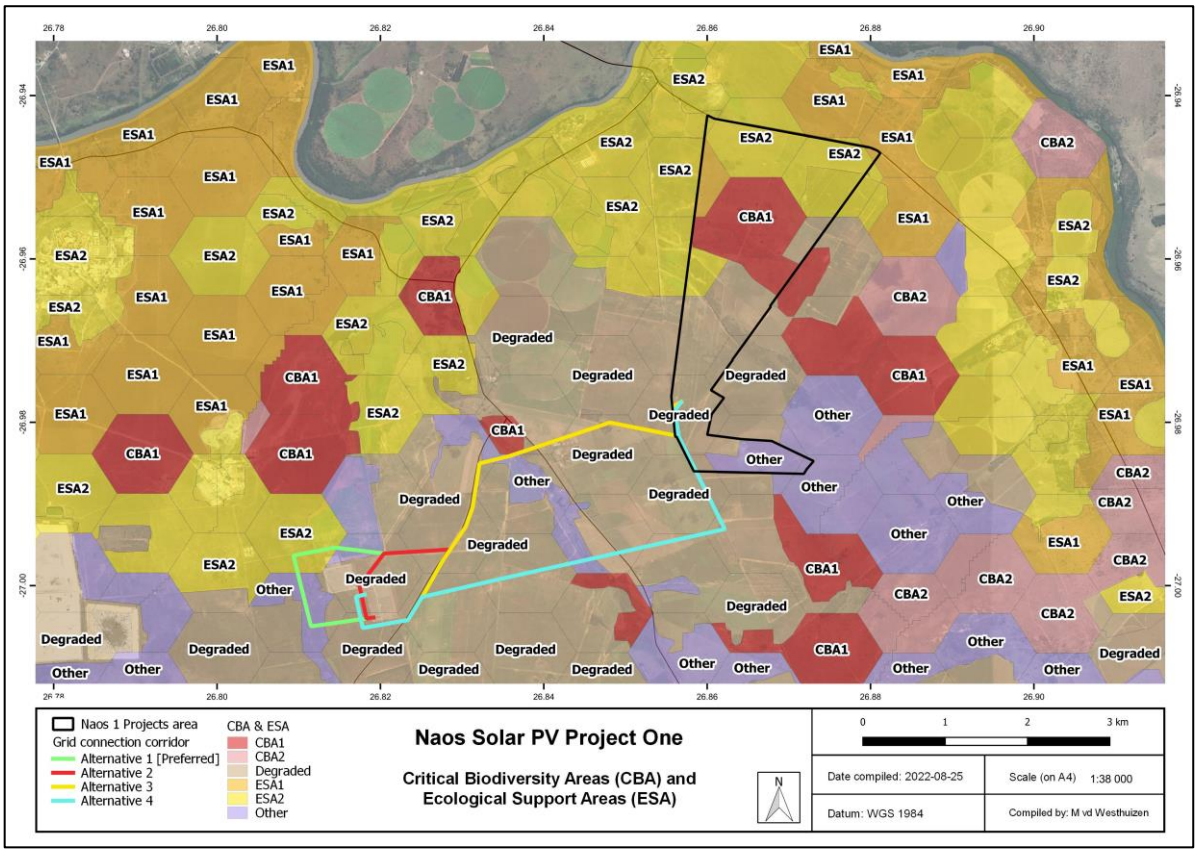


Figure 5.15: Critical Biodiversity Map for the Naos Solar PV Project One

Protected Plants and Trees

The Ecological Impact Assessment (Appendix D1) has confirmed that only one nationally listed protected species was recorded on site, namely *Crinum bulbispermum* (Orange River Lily) which is in the Declining category (NEMBA listed species, 2005). These plants were recorded in and next to the *Vachellia karroo– Asparagus laricinus* woodland.

The following plants that are protected according to Free State Nature Conservation Ordinance 8 of 1969 were recorded in the site.

Table 5.2: Recorded plants protected according to Free State Nature Conservation Ordinance 8 of 1969

Scientific name	**Common name**	Note
Aloe greatheadii	Spotted aloe	Free State Province
Boophone disticha	Poison bulb	Free State Province
Crinum bulbispermum	Orange river lily	National - Declining
Gladiolus permeabilis subsp. *edulis*	-	Free State Province
Helichrysum nudifolium	Hottentot's tea	Free State Province
Helichrysum rugulosum	Marotole (ss)	Free State Province
Helichrysum kraussii	Straw Everlasting	Free State Province
Schizocarphus nervosus	White Scilla	Free State Province

All species of the genus *Aloe*, *Crinum*, *Gladiolus*, *Helichrysum* and *Scilla* (*Schizocarpus*) are protected in the Free State Province (Free State Province, 1969). A permit should be obtained from authorities should any of these species be eradicated during the construction process.

Five endemic species were recorded, namely: *Cucumis heptadactylus, Hermannia cordata, Hermannia lancifolia, Selago capitellata, Trachyandra saltii*.

If the natural grassland areas are to be developed 30 % of the *Boophone, Crinum* and *Schizocarpus* population must be relocated to areas close by that will not be developed. If other nationally protected plant species are identified at a later stage, 30% of the population should be relocated (if it is species that can be successfully relocated).

No protected tree species were recorded.

In terms of the Species of Conservation Concern (SCC) identified in the DFFE Screening Tool (Appendix B), two species have been identified. None of these species were recorded, but there is suitable habitat for one of them. It may be present in the *Themeda triandra – Schizachyrium sanguineum* sandy grassland, although unlikely.

Declared Invasive Alien Species

The Alien and Invasive Species Regulations (GNR 599 of 2014) are stipulated as part of the National Environmental Management: Biodiversity Act (10/2004). The regulation listed a total of 559 alien species as invasive and further 560 species are listed as prohibited and may not be introduced into South Africa. Below is a brief explanation of the four categories of Invasive Alien Plants as per the regulation.

Category 1 plants are prohibited plants which must be controlled or eradicated. These plants serve no economic purpose and possess characteristics that are harmful to humans, animals or the environment.

- Category 1a: Plants are high-priority emerging species requiring compulsory control. All breeding, growing, moving and selling are banned
- Category 1b: Plants are widespread invasive species controlled by a management program.

Category 2 plants are invaders with certain useful qualities, such as commercial use or for woodlots, animal fodder, soil stabilisation, etc. These plants are allowed in demarcated areas under controlled conditions and in biocontrol reserves.

Category 3 plants are alien plants that are currently growing in, or have escaped from areas such as gardens, but that are proven invaders. No further planting is allowed (except with special permission), nor trade in propagative material. Existing plants may remain but must be prevented from spreading. Plants within the flood line and watercourses must be removed (Bromilow, 2010).

The following alien invasive and exotic plant species were recorded on site during the surveys as stipulated in the Alien and Invasive Species Regulations (GNR 599 of 2014). Refer to Table 5.3.

Table 5.3: Declared invader plant species recorded in the site (NEMBA: Alien and invasive species lists, 2020)

Scientific name	Common name	Invader category
Cirsium vulgare	Spear thistle, Scotch thistle	1b
Datura ferox	Large thorn apple	1b
Datura stramonium	Thorn apple	1b
Eucaluptus camaldulensis	River red gum	1b (in grassland)
Malvastrum coromandelianum	Prickly Malvastrum	1b
Opuntia ficus-indica	Sweet prickly pear, boereturksvy	1b
Verbena bonariensis	Purple top	1b
Xanthium spinosum	Spiny cocklebur	1b
Xanthium strumarium	Large cocklebur	1b

5.3.1.4 Surface Water Resources

The Wetland Impact Assessment (Appendix D8) provides feedback of the surface water features present within the general area. The feedback is as follows:

- National Freshwater Ecosystem Priority Areas (NFEPAs) - “Freshwater ecosystems” refer to all inland water bodies whether fresh or saline, including rivers, lakes, wetlands, sub-surface waters and estuaries. Consistent with global trends, high levels of threat have been reported for freshwater ecosystems. According to the National Biodiversity Assessment 2018 nearly 80% of inland wetland ecosystem types in South Africa are threatened and approximately 75% of inland wetland ecosystem types are both threatened and under-protected. There are no NFEPA wetlands or rivers inside the site, there is a NFEPA wetland and river north of the site, the Vaal River (Figure 5.16).
- National Wetland Map 5 - The National Wetland Map version 5 (NWM5) shows the distribution of inland wetland ecosystem types across South Africa and includes estuaries and the extent of some rivers . There are no NWM5 wetlands where the solar facility is proposed to be developed, the proposed grid connection corridor alternatives however traverse two NWM5 wetlands (Figure 5.16).

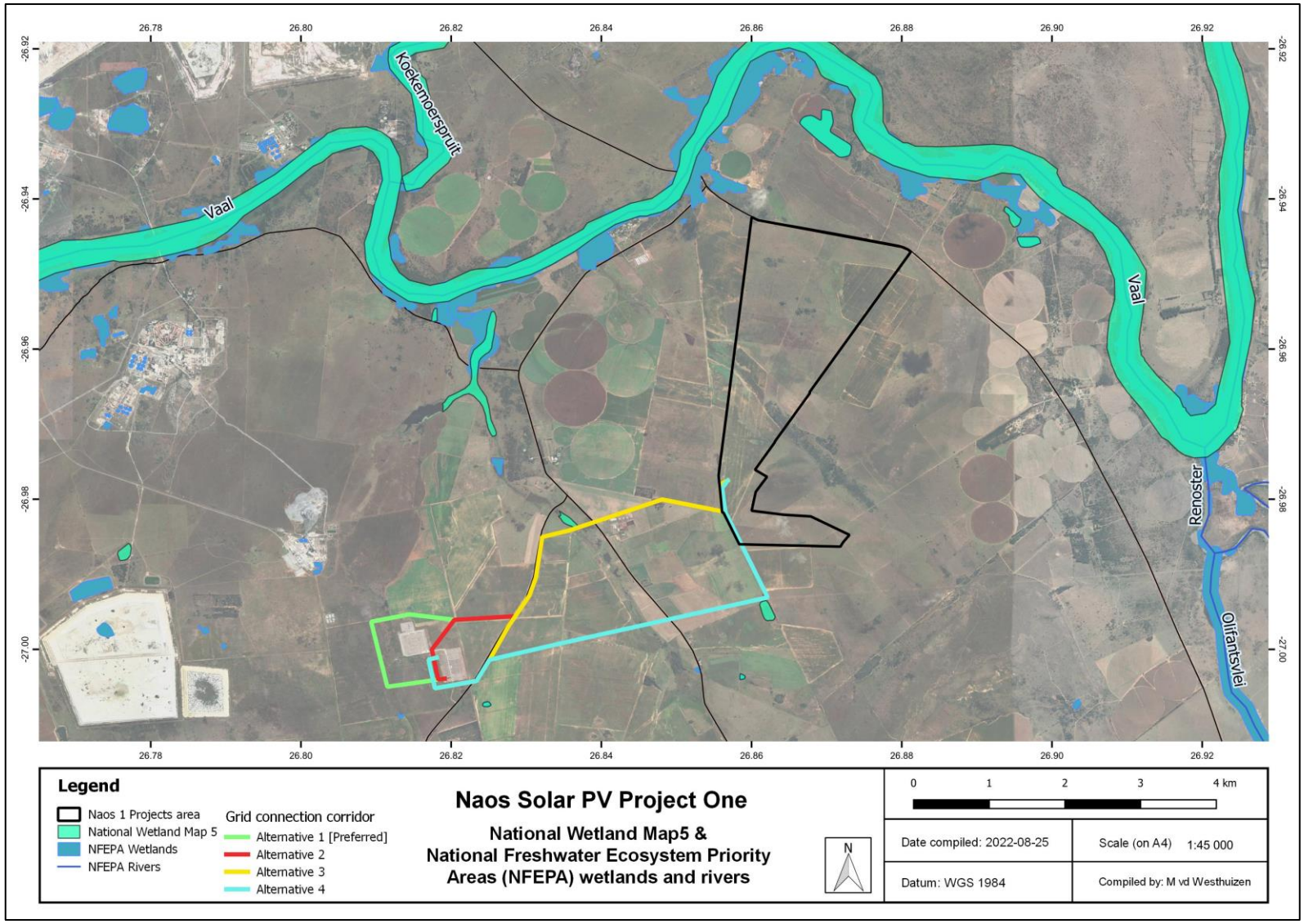


Figure 5.16: Wetlands and rivers located within the surrounding area of the Naos Solar PV Project One in terms of NFEPA and NMW5

Wetlands associated with the proposed development have been delineated and classified as follows:

- Exorheic depression (artificial dams);
- Unchannelled valley bottom wetland.

Refer to Figure 5.20 for an indication of the location of the surface water features in relation to the Naos Solar PV Project One.

Exorheic Depression (artificial dams)

The man-made dams in the site represent depressions that are classified as exorheic depressions. As the definition of an Inland System includes all inland aquatic ecosystems (i.e., not just wetlands), lakes and other open waterbodies are types of Inland Systems in terms of the Classification System, even if they are artificial such as dams. Man-made dams are therefore classified as aquatic systems since the landform characteristics of such systems fit the definition of a depression in that they typically have closed (or near closed) elevation contours and increase in depth from the perimeter to a central area of greatest depth. Lakes and other open waterbodies that have a maximum depth greater than two metres are called limnetic systems.

The vegetation associated with the dams is mostly sedges and bulrushes depending on the depth of the water and the substrate. Species such as *Cynodon dactylon, Schoenoplectus brachyceras, Cyperus congestus, Cyperus Eragrostis* and *Persicaria decipiens* mostly grow in the wetlands. Refer to Figure 5.17.

Figure 5.17: Depression wetland/artificial dam

Unchannelled valley bottom wetland

A valley-bottom wetland is a mostly flat wetland area located along a valley floor, often connected to an upstream or adjoining river channel.

The valley-bottom wetland at the site is unchannelled. Unchannelled valley-bottom wetlands are characterised by their location on valley floors, an absence of distinct channel banks, and

the prevalence of diffuse flows. These wetlands are generally formed when a river channel loses confinement and spreads out over a wider area, causing the concentrated flow associated with the river channel to change to diffuse flow (i.e. the river becomes an unchannelled valley-bottom wetland). These wetlands are associated with the grid connection corridor alternatives.

The vegetation associated with these wetlands is dominated by grasses and reeds. *Phragmites australis* and *Typha capensis* are the dominant reed species present and grass species include *Cynodon dactylon, Panicum schinzii, Aristida junciformis, Cymbopogon caesius* and *Setaria sphacelata var. sericea*. Refer to Figures 5.18 and 5.19.

Figure 5.18: Unchannelled valley bottom wetland present in the grid connection corridor alternatives

Figure 5.19: Unchannelled valley bottom wetland present in the grid connection corridor alternatives

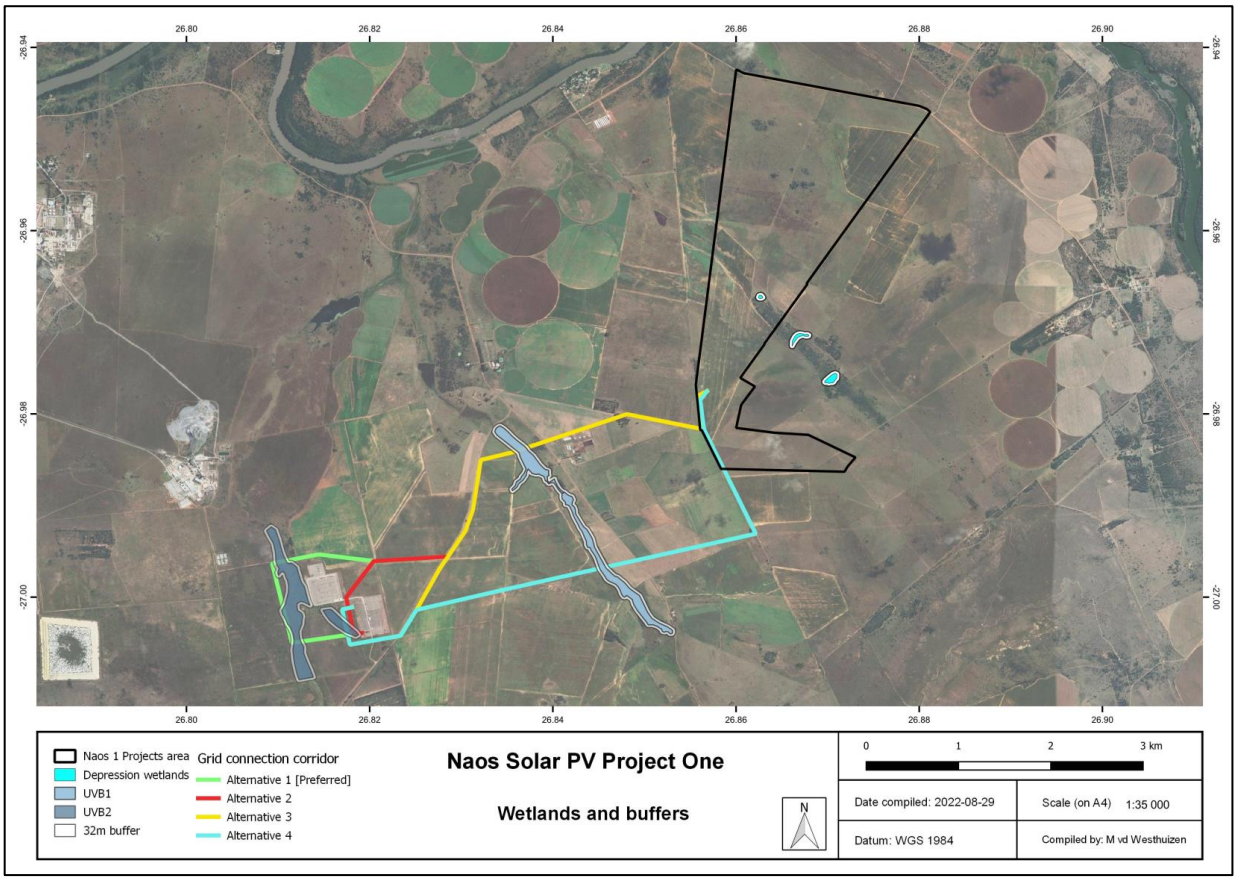


Figure 5.20: Wetland Delineation Map of the Naos Solar PV Project One

Wetland Integrity Assessments were also undertaken as part of the Wetland Impact Assessment. In determining the integrity of the drainage system, the condition of the site and the indirect and direct disturbances are considered.

WET-Health Assessment

Three modules, namely hydrology, geomorphology and vegetation, were assessed as a single unit for the hydrogeomorphic (HGM) Units and subsequently an area weighted score was obtained for the HGM Units. The potential impacts of activities such as agriculture, drought and altered hydrological functions within the greater catchment were taken into consideration during the assessment.

The Present Ecological State (PES) Category for all three wetlands is a C, meaning that the functionality of the wetland is Moderately modified but with some loss of natural habitats. Based on the Trajectory of change, the wetlands PES is likely to remain stable over the next 5 years.

Ecosystem Services

Physical and hydrological features allow hydro-geomorphic units to perform specific ecosystems services. A Wet-EcoService evaluation was conducted for the hydro-geomorphic type found on site to determine the services as described in the methodology. The degree of disturbance and modification of wetlands results in a decrease in the ability to which they can perform these ecosystem services. Refer to Tables 5.4, 5.5 and 5.6.

Table 5.4: Ecosystem Services for the Depression

		Present State			
ECOSYSTEM SERVICE		Supply	Demand	Importance Score	Importance
REGULATING AND SUPPORTING SERVICES	Flood attenuation	1,3	0,0	0,0	Very Low
	Stream flow regulation	1,7	0,0	0,2	Very Low
	Sediment trapping	No scores	0,8	No scores	No scores
	Erosion control	0,6	0,0	0,0	Very Low
	Phosphate assimilation	No scores	1,5	No scores	No scores
	Nitrate assimilation	1,2	1,5	0,4	Very Low
	Toxicant assimilation	No scores	0,8	No scores	No scores
	Carbon storage	0,8	0,0	0,0	Very Low
	Biodiversity maintenance	1,6	0,0	0,0	Very Low
PROVISIONING SERVICES	Water for human use	0,6	0,0	0,0	Very Low
	Harvestable resources	1,5	0,0	0,0	Very Low
	Food for livestock	4,0	0,0	2,5	Moderately High
	Cultivated foods	3,0	0,0	1,5	Moderately Low
CULTURAL SERVICES	Tourism and Recreation	0,6	0,0	0,0	Very Low
	Education and Research	0,8	0,0	0,0	Very Low
	Cultural and Spiritual	1,0	0,0	0,0	Very Low

Table 5.5: Ecosystem Services for the Unchannelled valley bottom 1

		Present State			
ECOSYSTEM SERVICE		Supply	Demand	Importance Score	Importance
REGULATING AND SUPPORTING SERVICES	Flood attenuation	#VALUE!	0,0	#VALUE!	#VALUE!
	Stream flow regulation	3,0	0,0	1,5	Moderately Low
	Sediment trapping	2,3	1,0	1,3	Low
	Erosion control	1,7	0,3	0,4	Very Low
	Phosphate assimilation	1,4	1,0	0,4	Very Low
	Nitrate assimilation	2,0	1,0	1,0	Low
	Toxicant assimilation	2,1	1,0	1,1	Low
	Carbon storage	1,0	0,0	0,0	Very Low
	Biodiversity maintenance	1,4	1,5	0,7	Very Low
PROVISIONING SERVICES	Water for human use	2,4	0,0	0,9	Low
	Harvestable resources	1,0	0,0	0,0	Very Low
	Food for livestock	3,0	0,0	1,5	Moderately Low
	Cultivated foods	2,5	0,0	1,0	Low
CULTURAL SERVICES	Tourism and Recreation	0,9	0,0	0,0	Very Low
	Education and Research	1,3	0,0	0,0	Very Low
	Cultural and Spiritual	1,0	0,0	0,0	Very Low

Table 5.6: Ecosystem Services for the Unchannelled valley bottom 2

		Present State			
ECOSYSTEM SERVICE		Supply	Demand	Importance Score	Importance
REGULATING AND SUPPORTING SERVICES	Flood attenuation	#VALUE!	0,0	#VALUE!	#VALUE!
	Stream flow regulation	3,0	0,0	1,5	Moderately Low
	Sediment trapping	2,8	1,0	1,8	Moderate
	Erosion control	2,1	0,5	0,8	Low
	Phosphate assimilation	2,3	1,0	1,3	Low
	Nitrate assimilation	2,3	1,0	1,3	Moderately Low
	Toxicant assimilation	2,5	1,0	1,5	Moderately Low
	Carbon storage	1,3	0,0	0,0	Very Low
	Biodiversity maintenance	1,7	1,5	1,0	Low
PROVISIONING SERVICES	Water for human use	1,6	0,0	0,1	Very Low
	Harvestable resources	1,5	0,0	0,0	Very Low
	Food for livestock	2,0	0,0	0,5	Very Low
	Cultivated foods	2,5	0,0	1,0	Low
CULTURAL SERVICES	Tourism and Recreation	0,8	0,0	0,0	Very Low
	Education and Research	1,0	0,0	0,0	Very Low
	Cultural and Spiritual	1,0	0,0	0,0	Very Low

In terms of the Ecological Importance and Sensitivity of the wetlands present the Wetland Impact Assessment confirms that the importance and sensitivity are respectively low / marginal (depressions), and moderate (Unchannelled Valley Bottom Wetlands).

5.3.1.5 Climate

The climate for Klerksdorp is given, as it is the closest town with weather data available. Klerksdorp is 1308m above sea level. Klerksdorp's climate is a local steppe climate. The climate here is classified as BSh by the Köppen-Geiger system. The average annual temperature for the region is 18.1 °C. The annual rainfall is around 610 mm (Climate-data.org, 2022).

5.3.1.6 Biodiversity

The primary cause of loss of biological diversity is habitat degradation and loss (IUCN, 2004; Primack, 2006). In the case of this study special attention was given to the identification of sensitive species or animal life and birds on site. The following section will discuss the state of biodiversity on the site in more detail.

Avifaunal

A baseline description of the avifaunal community has been provided in the Avifaunal Impact Assessment (Appendix D2).

According to the Second South African Bird Atlas Project 2 (SABAP2) species list, it is estimated that a total of 211 birds species occur in the broader area of the proposed site. Of the 211 bird

species 13 bird species were observed during the transect surveys. An additional total of 8 bird species were recorded during fixed point avifaunal surveys at the wetland habitat.

Of the Grassland species, one species, the Pied Crow, was not previously recorded on site according to the SABAP2 species list for pentad 2655_2650. Also, one waterbird species, the Hamerkop, is a newly observed bird species that was not previously recorded during the second bird atlas project. This may be attributed to the seasonal movement patterns of birds. There are many long-distance migrant species that will only be recorded during early to mid-summer and also some regional migrants and nomadic species that are more likely to occur in winter.

The overall avifaunal species occurring at the proposed site are dominantly represented by chats, swifts, pipits, kites, martins, wagtails, lapwings, herons and cisticolas. One bird species of priority, the Lanner Falcon, was encountered during the transect surveys. The Lanner Falcon was encountered three times, where it was seen once in the Grassland ecosystem and twice approximately 70 m perching on trees.

In terms of Species of Conservation Importance, only one species was encountered on site during the structured surveys that is classified as Red Data Species. This is the Lanner Falcon.

South Africa has a rich diversity of nationally and regionally endemic species that are found nowhere else on earth and, therefore, warrant consideration for assessment of sensitivity to potential developments. The endemic Northern Black Korhaan (*Afrotis afraoides*) was encountered during the transect surveys. The Northern Black Korkhaan was heard 100 m north patch calling on the Grassland ecosystem and incidentally observed 3 times 150 m south patch calling on the Grassland habitat.

As part of the Avifaunal Impact Assessment (Appendix D2), an avifaunal population assessment was undertaken. From the survey, a total of 23 bird species were observed within the proposed site i.e. waterbirds and birds encountered during transect surveys. Out of the 23 observed species, one (1) species was classified as Red Data. Previous records from SABAP 2 also revealed that there is only one Red Data (Lanner Falcon, *Falco biarmicus*) species present within the area. A total of 3 individuals of the Lanner Falcon were encountered during the surveys.

The primary threat to the Lanner Falcon is the loss or transformation of habitat within the Grassland Biome. Secondary threats, amongst many others, include collisions with power lines and poisoning by agrochemicals.

Additionally, there were medium to large sized species that are threatened by habitat loss and may be prone to collision (Table 5.7). During the survey, certain habitats were mapped as they were inhabiting target species. These habitats include grassland areas and artificial dams within the site.

Table 5.7: Collision prone species

Scientific name	Common name	Preferred habitat	Threats
Afrotis afraoides	Northern Black Korhaan	Grassland & Savanna	Collisions, Disturbance, Habitat loss

Asio capensis	Marsh Owl	Moist Grassland	Disturbance, Habitat loss
Scopus umbretta	Hamerkop	Waterbody margins	Disturbance, Habitat loss
Falco biarmicus	Lanner Falcon	Widespread	Collisions, Disturbance, Electrocution, Habitat loss

Although the area is located less than a kilometre from the Vaal River, one would expect a high diversity of bird species within the site. However, the site had a low species diversity.

The overall species richness of the site is considered low. Species evenness reflected that the site was highly even. The site can be concluded to have a moderately low diversity.

Fauna

The number of mammal species supported by a plant community depends on several factors like the primary production, seasonal availability of resources, floral heterogeneity, diversity of plant structure, nature of the substratum and previous history. Each mammal species has a particular niche, which can be regarded as the sum of all ecological requirements of a species namely food, space, shelter and physical conditions. The distribution and abundance of animal species does not rigorously follow that of plant communities or biomes. Instead, mammal species seem to have certain preferences for a specific habitat type.

A survey was conducted during March 2022 by the ecological specialist to identify specific fauna habitats, and to compare these habitats with habitat preferences of the different fauna groups (birds, mammals, reptiles, amphibians) occurring in the quarter degree grid.

The following habitat types were identified:

- Indigenous grassland on sandy soil
- Woodland
- Artificial dams / wetlands
- Planted pastures (*Digitaria eriantha*)
- Agricultural field

Fauna species lists have been provided in the Ecological Impact Assessment (Appendix D1). The fauna species confirmed to be present on site is included in Table 5.8.

Table 5.8: Mammals confirmed to be present on site

Family	Scientific name	Common name	Red list
Bovidae	*Raphicerus campestris*	Steenbok	LC
Bovidae	*Tragelaphus strepsiceros*	Greater Kudu	LC
Canidae	*Canis mesomelas*	Black-backed Jackal	LC
Cercopithecidae	*Chlorocebus pygerythrus*	Vervet Monkey	LC
Hystricidae	*Hystrix africaeaustralis*	Cape Porcupine	LC
Mustelidae	*Mellivora capensis*	Honey Badger	LC

Orycteropodidae	*Orycteropus afer*	Aardvark	LC
Suidae	*Phacochoerus africanus*	Common Warthog	LC

*LC- Least Concern

No amphibian or reptile species of conservation concern distribution overlaps with the site.

The DFFE Screening Tool Report (Appendix B) lists two fauna species of conservation concern, namely Hydrictis maculicolis (Spotted-necked otter) and Hydroprogne caspia (Caspian Tern) that may potentially be present at site. These are discussed below:

***Hydrictis maculicolis* (Spotted-necked otter)**

Spotted-necked Otters are thought to inhabit freshwater habitats where water is not silt-laden, and is unpolluted, and rich in small fishes. However, anecdotal observations suggest they can occur, and can be common, in relatively polluted rivers, such as the Braamfonteinspruit, Jukskei River and Blesbokspruit, Gauteng Province, and the Vaal River.

Adequate riparian vegetation, in the form of long grass, reeds, or bushes, is also essential to provide cover, especially during periods of inactivity.

The species may be present at the Vaal River, which is close to the site, but there is no suitable habitat for spotted-necked otters on site.

***Hydroprogne caspia* (Caspian Tern)**

The Caspian Tern is mostly found in sheltered coastal embayments (harbours, lagoons, inlets, bays, estuaries and river deltas) and those with sandy or muddy margins are preferred. They also occur on near-coastal or inland terrestrial wetlands that are either fresh or saline, especially lakes (including ephemeral lakes), waterholes, reservoirs, rivers and creeks. They also use artificial wetlands, including reservoirs, sewage ponds and saltworks. In offshore areas the species prefers sheltered situations, particularly near islands, and is rarely seen beyond reefs.

The species may be present at the Vaal River, which is close to the site, but there is no suitable habitat for Caspian Terns on site. The unchanneled valley bottom wetland next to Mercury Substation is quite large, but there is no open water present.

5.3.1.7 Visual landscape

The Visual Impact Assessment (Appendix D3) considers the landscape character within which the development is proposed to be developed.

When considering the site within which the solar facility is proposed to be developed it is confirmed that the area is characterised by a low significance in elevation differences, except to the north where the Vaal River slopes down towards the river. Sudden differences in elevation are scattered throughout the area in the forms of mine dumps and tailing dams. The site is located at an above mean sea level (amsl) of approximately 1353m at the highest elevation and at an amsl of 1307m at the lowest elevation, a difference of 46m. The site drains towards the north west, towards the Vaal River.

The grid connection corridor alternatives are located in an area with a low significance in elevation differences, except to the north where the Vaal River slopes down towards the river.

Sudden differences in elevation are scattered throughout the area in the forms of mine dumps and tailing dams. The grid connection corridor alternatives are located at an above mean sea level (amsl) of approximately 1350m (Option 4) at the highest elevation and at an amsl of 1303m at the lowest elevation within a watercourse, a difference of 47m. The alternatives drain towards the watercourse from both sides.

The landform and drainage described above is unlikely to limit visibility except adjacent to the Vaal River. Areas within 5km from the proposed development might have a clear view without taking existing screening into account.

Different types of development occurs within the surrounding area of the site which contributes to the landscape. These include:

- **Industrial Development;** Industrial development associated with urban development and mining. Mining plays a big role in the area and is one of the main development types in the area. Large scale gold mining is present to the north west.
- **Urban Development**; Orkney, Klerksdorp and Stilfontein being the main urban development in the area. A number of other formal and informal settlements are present within the area.
- **Sports and Recreational Development;** Facilities associated with urban development like sports clubs, sport stadiums and the Vaal River.
- **Agricultural Development;** This is also one of the main development types in the area consisting mostly out of cattle, dryland cultivation and irrigation farming.
- **Service Development;** Facilities and infrastructure associated with development. These include roads, power infrastructure, water infrastructure etc. Most services are linked to urban and mining development.
- **Tourism Development;** A number of guest houses and lodges are present within the study area. Tourism development is rather low further from the Vaal River. The Vaal River hosts a number of tourism developments.

Furthermore, the Visual Impact Assessment has identified sensitive visual receptors that may be impacted by the proposed development. Visual Receptors can be defined as: “Individuals, groups or communities who are subject to the visual influence of a particular project”. This highlights possible sensitive visual receptors, within a 10km radius from the proposed development, which due to use could be sensitive to landscape change. They include:

- **Area Receptors** which include:
  - Khuma
  - Vaal Reefs village.
- **Linear Receptors** which include:
  - R502 regional road.
  - Vermaasdrift road.
  - S643 secondary road.
  - Vaal River.
  - R76 regional road.

- **Point Receptors** which include:
    - Homesteads on farms.
    - Smallholdings.
    - Sports and Recreational facilities.
    - Tourism and lodging facilities in close proximity are Wawielpark Holiday Resort, Seekoeigat camping and fishing facility and Clementia Function and Conference Venue.

Zone of Theoretical Visibility Model

A Zone of Theoretical Visibility (ZTV) is a Geographic Information System (GIS)-generated tool to identify the likely (or theoretical) extent of visibility of a development. The tool used in this model does not take existing screening into account but only the above mean sea level of the landscape.

Tables 5.9, 5.10 and 5.11 reflects the visibility rating in terms of proximity on sensitive receptors from the solar facility and grid connection alternatives within a 10km radius.

Table 5.9: ZTV Visibility Rating in terms of proximity from the solar facility site

Radius	Visual Receptors	Visibility rating in terms of proximity
0-1km	- Vermaansdrift road. - Clementia Function and Conference Venue. - S643 secondary road. **Coverage: 58%**	Very High
1-3km	- Two homesteads on farms. - Smallholdings. - Wawielpark Holiday Resort. - Vaal River. - Vermaasdrift road. **Coverage: 27%**	High
3-5km	- Three homesteads on farms. - Vaal River. - River homes. - Two lodging facilities. - Vermaasdrift road. **Coverage: 21%**	Medium
5-10km	- 11 homesteads on farms. - R502 regional road. - Vaal River. - One lodging facility. **Coverage: 16%**	Low

Table 5.10: ZTV Visibility Rating in terms of proximity from the grid connection corridor alternatives 1a, 1b, 1c, 2 and 3

Radius	Visual Receptors	Visibility rating in terms of proximity
0-1km	- Two homesteads on farms. - Vermaasdrift road. **Coverage: 58%**	Very High
1-3km	- Four homesteads on farms. - Vermaasdrift road. **Coverage: 30%**	High
3-5km	- One homestead on a farm. - Vermaasdrift road. - Vaal River. - Wawielpark Holiday Resort. - Smallholdings. - S643 secondary road. **Coverage: 15%**	Medium
5-10km	- Four homesteads on farms. - S643 secondary road. - Vermaasdrift road. - Vaal River. - Vaal Reefs Village. - River homes. **Coverage: 10%**	Low

Table 5.11: ZTV Visibility Rating in terms of proximity from the grid connection corridor alternative 4

Radius	Visual Receptors	Visibility rating in terms of proximity
0-1km	- Two homesteads on farms. - Vermaasdrift road. **Coverage: 52%**	Very High
1-3km	- Four homesteads on farms. - Vermaasdrift road. **Coverage: 33%**	High
3-5km	- Wawielpark Holiday Resort. - S643 secondary road. - Smallholdings. - Vermaasdrift road. **Coverage: 14%**	Medium
5-10km	- Five homesteads on farms. - Vaal River.	Low

	- Vermaasdrift road. - River homes. **Coverage: 11%**	

The ZTV maps will give a clearer understanding of areas susceptible to line of sight from the solar facility and grid connection corridor alternatives. Please Note: The difference in the ZTV assessment's maps for grid connection corridor alternatives 1a, 1b, 1c, 2 and 3 are negligible, therefore these alternatives will be assessed as one. Refer to the ZTV maps as results for motivation. Grid connection Corridor alternative 4 will be assessed on its own. Refer to Figures 5.21 – 5.27.

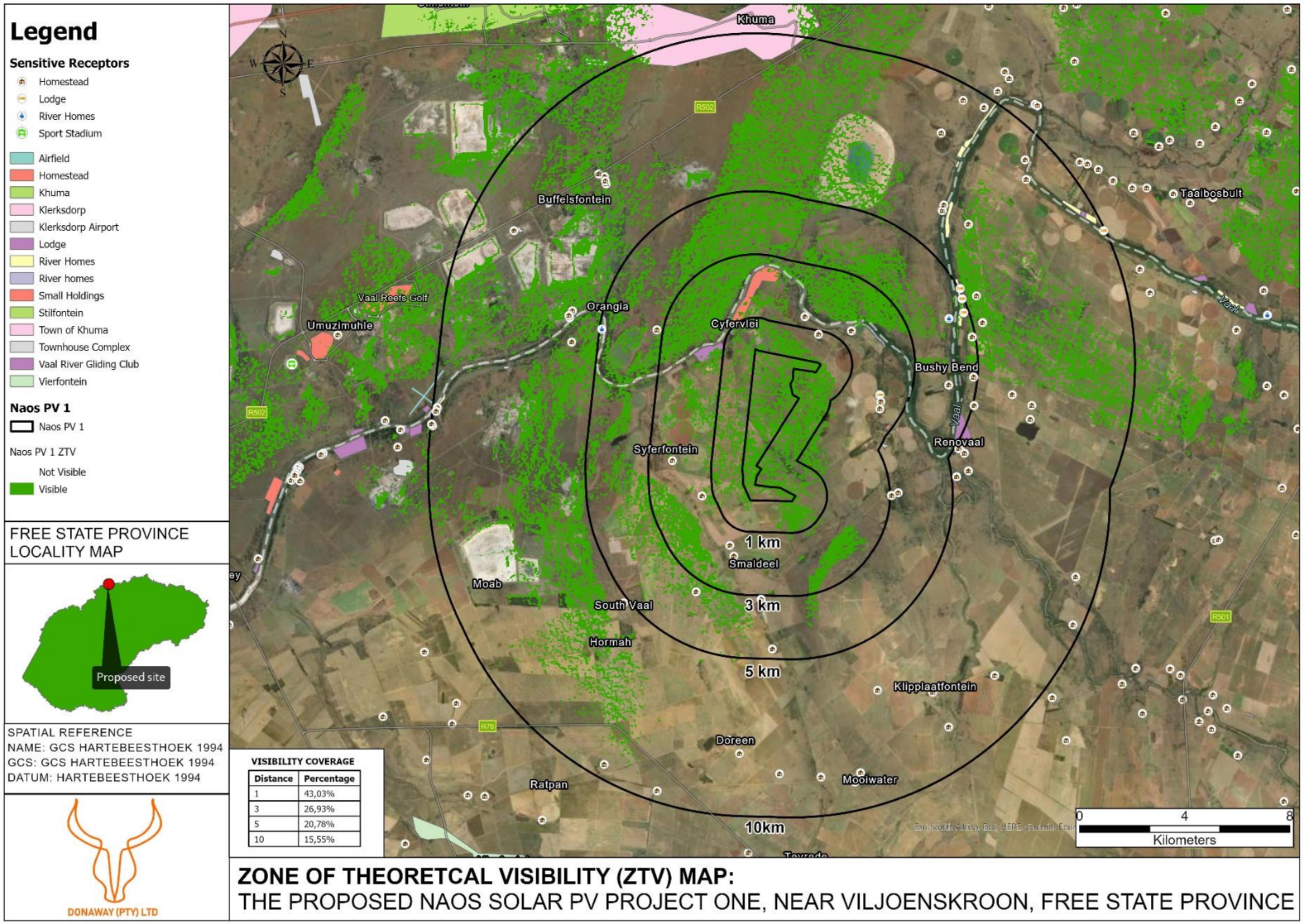


Figure 5.21: Zone of Theoretical Visibility (ZTV) for the Naos Solar PV Project One site

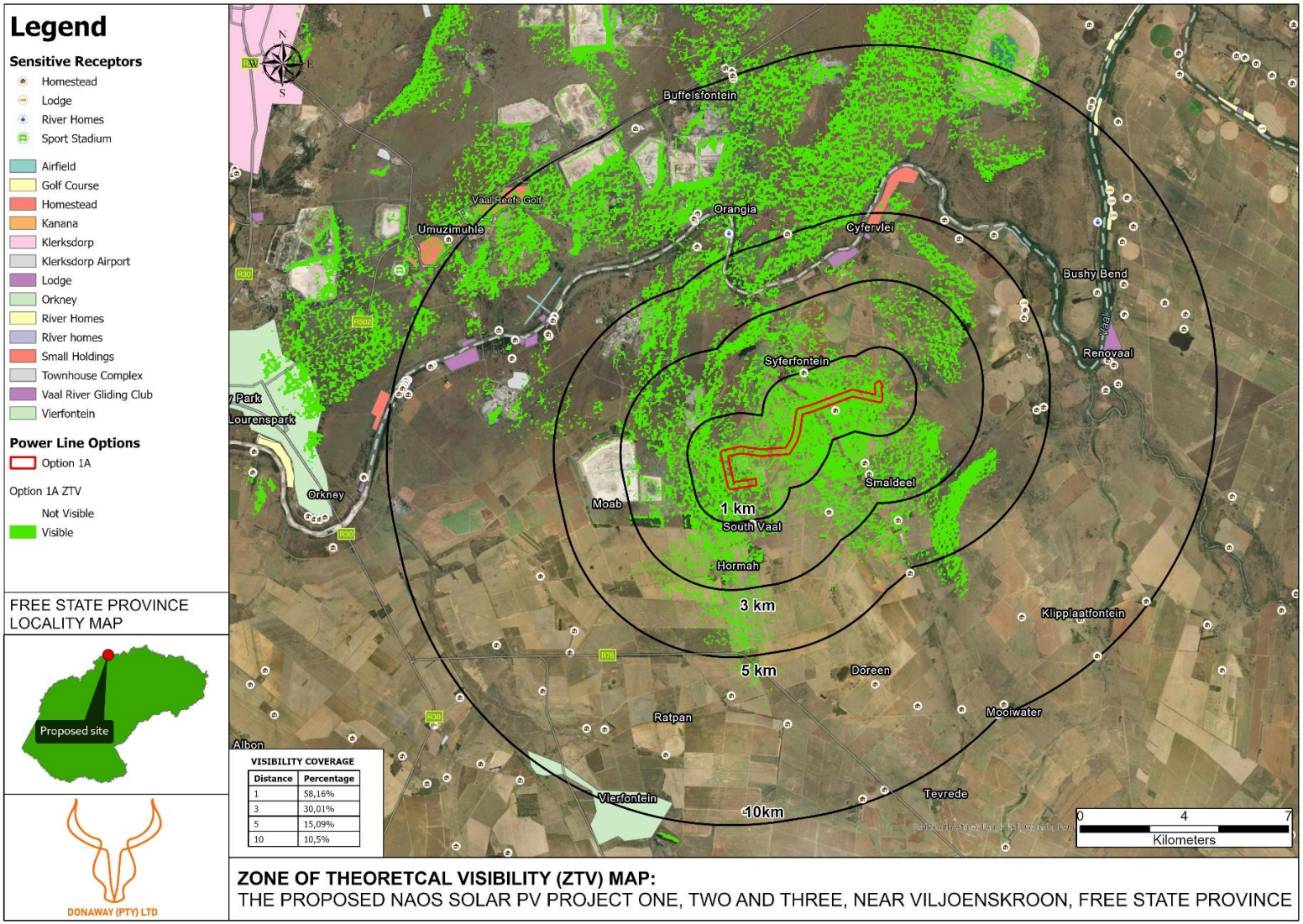


Figure 5.22: Zone of Theoretical Visibility (ZTV) for the grid connection corridor alternative 1a

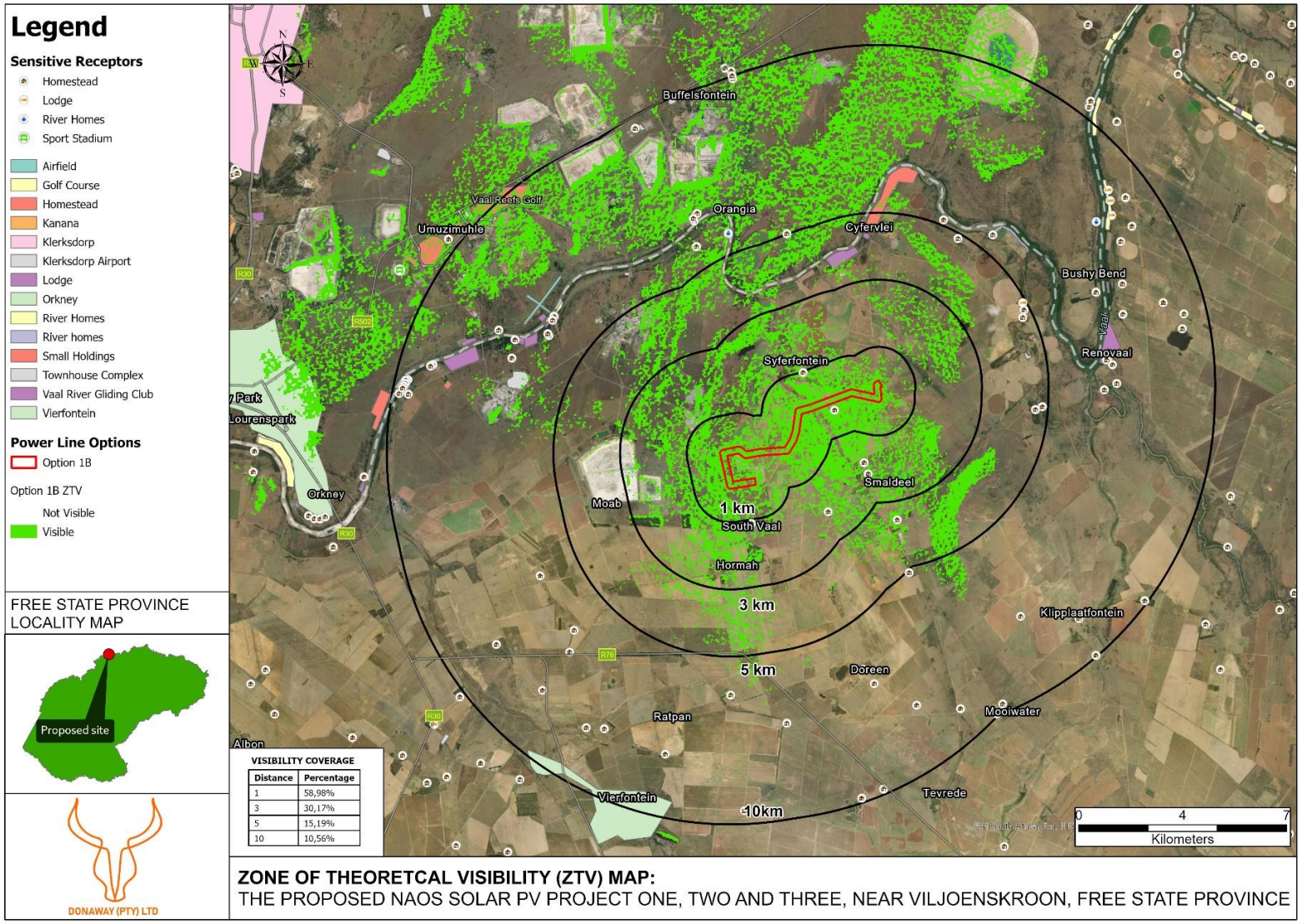


Figure 5.23: Zone of Theoretical Visibility (ZTV) for the grid connection corridor alternative 1b

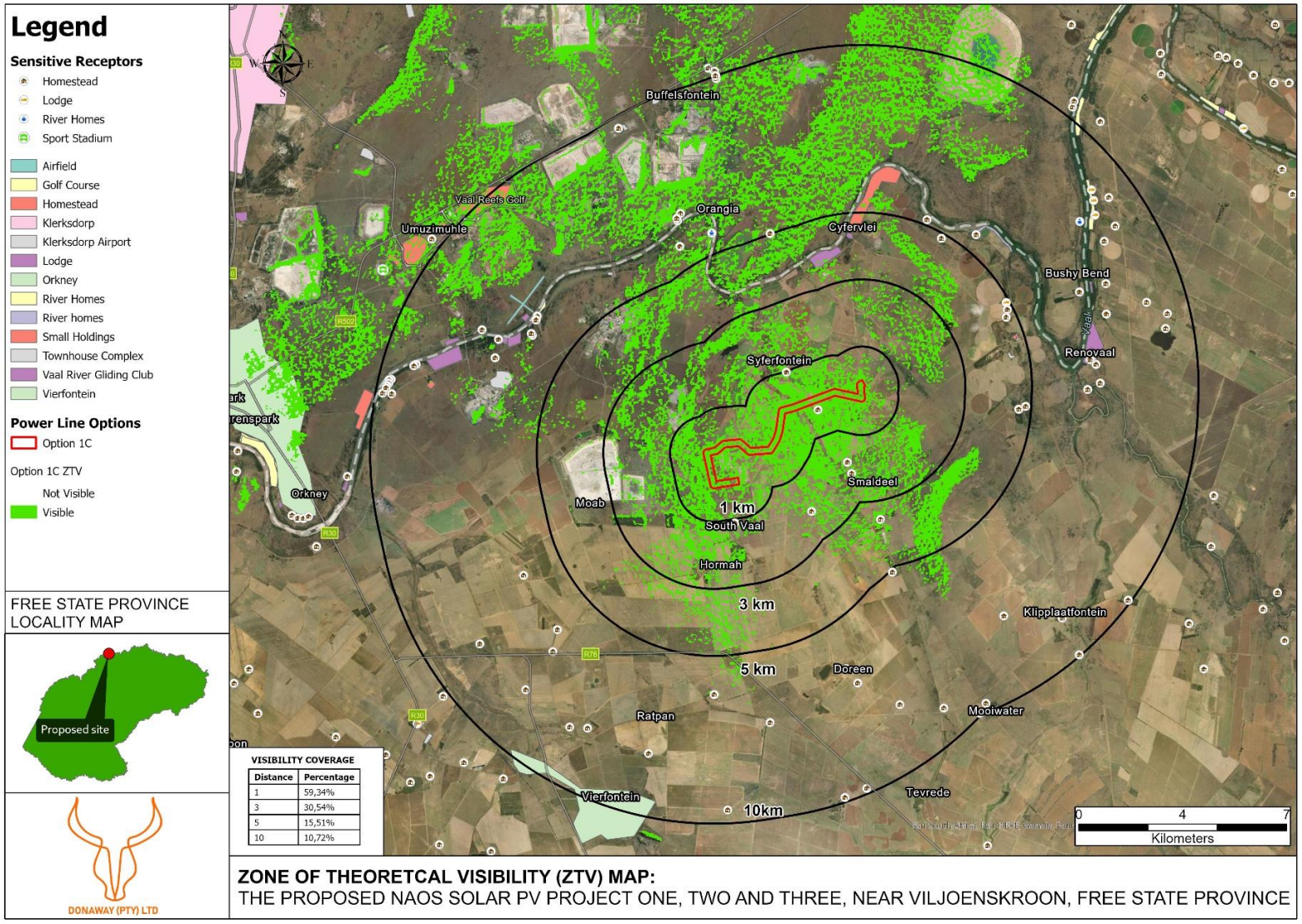


Figure 5.24: Zone of Theoretical Visibility (ZTV) for the grid connection corridor alternative 1c

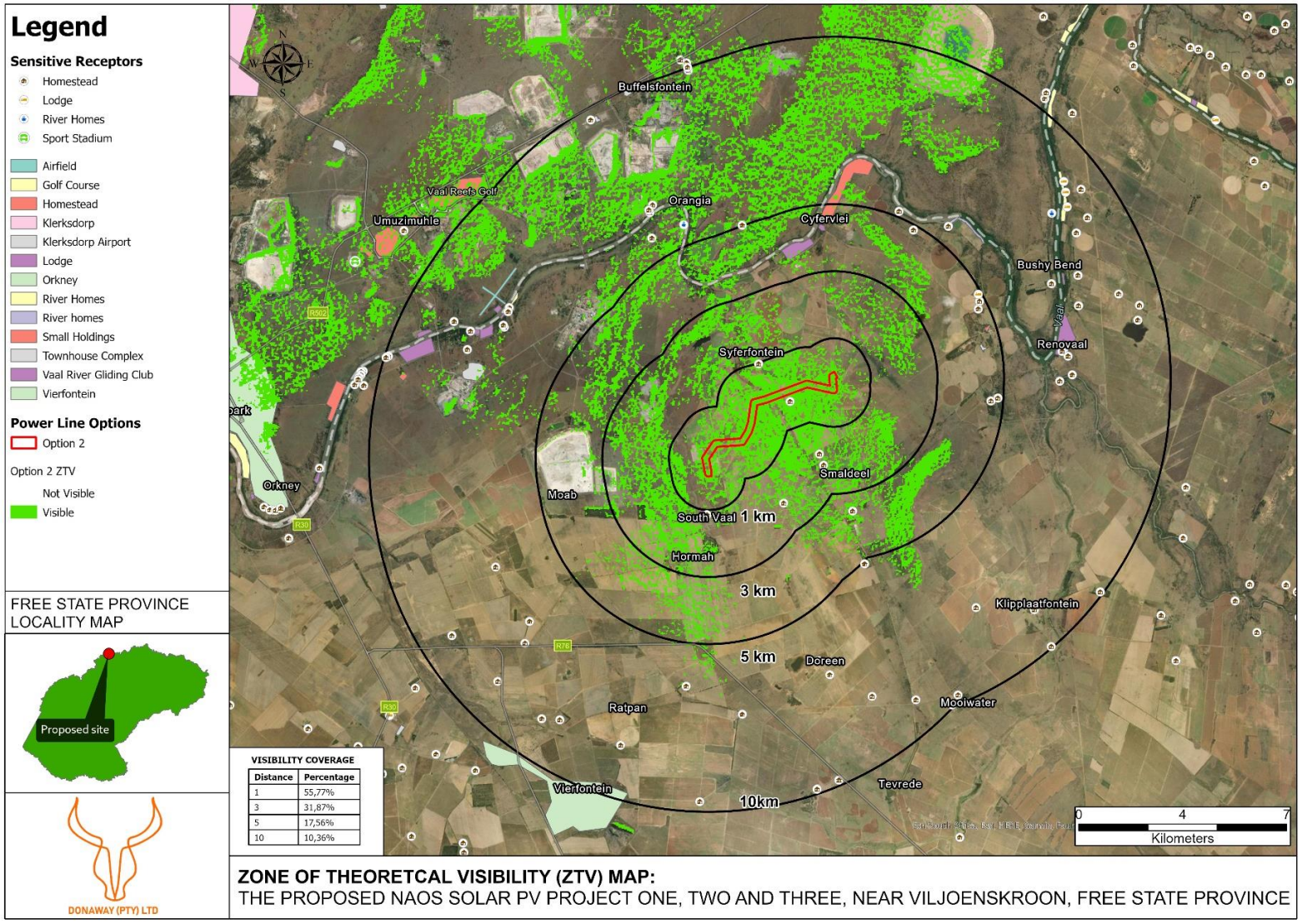


Figure 5.25: Zone of Theoretical Visibility (ZTV) for the grid connection corridor alternative 2

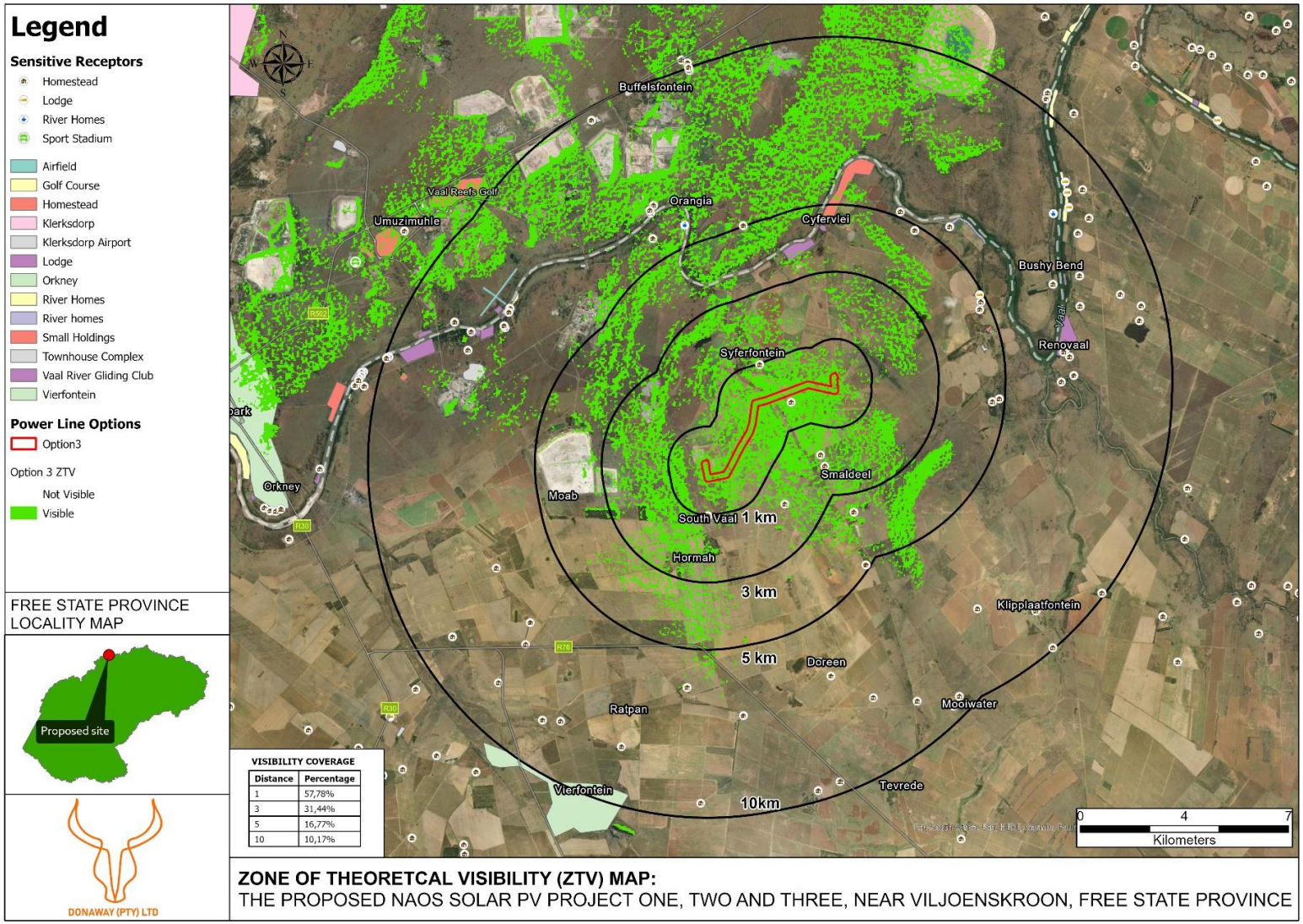


Figure 5.26: Zone of Theoretical Visibility (ZTV) for the grid connection corridor alternative 3

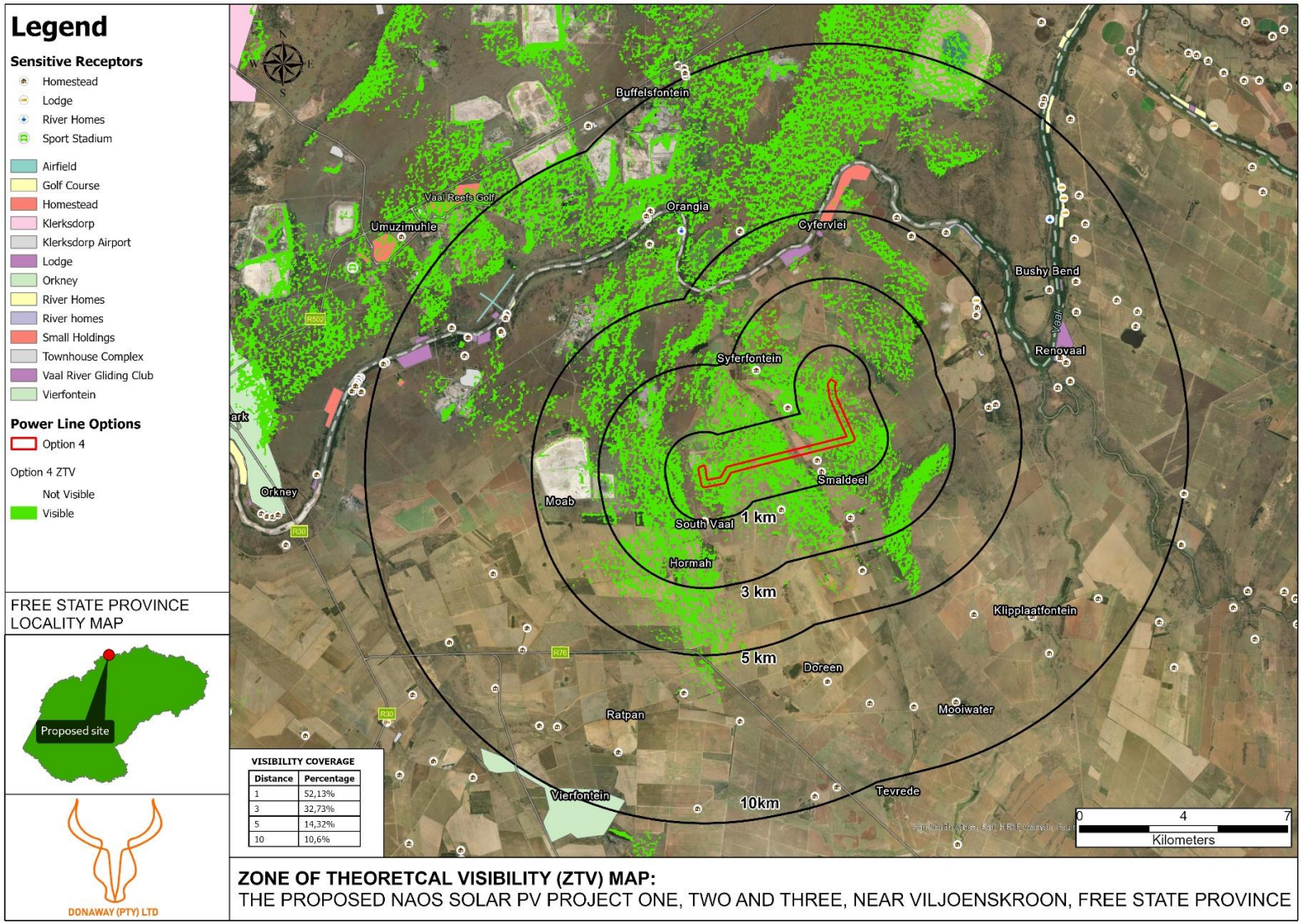


Figure 5.27: Zone of Theoretical Visibility (ZTV) for the grid connection corridor alternative 4

5.3.2 Description of the socio-economic environment

The socio-economic environment is described with specific reference to social, economic, heritage and cultural aspects.

5.3.2.1 Socio-economic conditions

According to the Social Impact Assessment (Appendix D7) Free State Province is the landlocked core of the country. It is centrally placed, with good transport corridors to the north and the coast. It is the third biggest of South Africa's nine provinces in terms of size, and primary agriculture is a key economic sector. Mining is also important but has been declining steadily since 2008. Although the Free State is the third-largest province in South Africa, it has the second-smallest population and the second-lowest population density. It covers an area of 129 825km² and has a population of 2 834 714 – 5.1% of the national population. Languages spoken include Sesotho (64.4%), Afrikaans (11.9%) and Zulu (9.1%). The Free State Province contributes 5.4% to South Africa's total gross domestic product (2006).

Agriculture is a key economic sector – 8% of the country's produce comes from Free State. In 2010, agriculture provided 19.2% of all formal employment opportunities in the region. The economy is dominated by agriculture, mining and manufacturing. Known as the 'bread-basket' of South Africa, about 90% of the province is under cultivation for crop production. It produces approximately 34% of the total maize production of South Africa, 37% of wheat, 53% of sorghum, 33% of potatoes, 18% of red meat, 30% of groundnuts and 15% of wool. The province is the world's fifth-largest gold producer, with mining the major employer.

The Fezile Dabi District Municipality is a Category C municipality, formerly known as the Northern Free State District Municipality, situated in the north of the Free State. It is bordered by the North West, Gauteng and Mpumalanga Provinces to the north, Thabo Mofutsanyana District to the south, and Lejweleputswa District to the west.

The municipality is the smallest district in the province, covering an area of 20 660km2 and only making up 16% of its geographical area. It consists of four local municipalities: Moqhaka, Metsimaholo, Ngwathe and Mafube. Refer to Figure 5.28.

The main attraction site, the Vredefort Dome, being the third-largest meteorite site in the world, is located within the district.

The main economic sectors include: Trade (22%), community services (20%), manufacturing (13%), households (13%), agriculture (12%), finance (7%), construction (6%), transport (5%).

In 2011 the Municipality had a population of 488 036 with an unemployment rate of 33.9% and a youth unemployment rate of 44.4%. By 2016 only 48.3% of dwellings had piped water inside their dwellings and 7.7% of household still did not have electricity in their dwellings.

Figure 5.28: Local Municipalities of the Fezile Dabi District Municipallity

The Moqhaka Local Municipality is a Category B municipality situated within the southern part of the Fezile Dabi District in the Free State Province. It is the largest of four municipalities in the district, making up over a third of its geographical area and covering an area of 7 925m^2. The former Kroonstad, Steynsrus and Viljoenskroon Transitional Local Councils and sections of the Riemland, Kroonkop and Koepel Transitional Rural Councils are included in the municipality. The seat of local government is Kroonstad. The community's name is the south Sesotho word for 'crown'.

The general tendency of migration from rural to urban areas is also occurring in the area, as is the case in the rest of the Free State Province. In comparison to the other municipalities within the Fezile Dabi District, it appears as if Moqhaka is significantly less urbanised. The population dwindled from 2011 at 160 532 to 154 732 in 2016. In 2011 the unemployment rate stood at 35.2% and the youth unemployment rate at 47.2%. In 2016 89.7% of households had flush toilets connected to sewerage and 96.3% of households had electricity for lighting in their dwellings.

The Greater Kroonstad area is the centre of a large agricultural community that plays an important role in the economy of the district. Subsequently, industrial activities contribute significantly to the district's economy. The Department of Correctional Services and the School of Engineers military bases are situated in the town. Kroonstad has recently become a distinguished holiday destination due to the ultra-modern and popular holiday resort of Kroonpark, adjacent to the Vals River. The urban area is situated adjacent to the N1 National Road and located adjacent to one of the largest and most important four-way railway junctions in South Africa.

The Viljoenskroon/Rammulotsi urban area is located within an area of extreme agricultural significance. The urban area plays a significant role in providing residential opportunities to the adjacent goldfields and mining activities in the North West Province. The Provincial Roads P15/1 and P15/2 from Kroonstad to Klerksdorp in the North West Province extend through the area from north to south.

The Steynsrus/Matlwangtlwang urban area is situated approximately 45km east of Kroonstad and 92km west of Bethlehem. The major link road between Bethlehem and Kroonstad stretches adjacent to the urban area.

The main economic sectors in the municipality are Agriculture, commercial transport, business services and mining.

5.3.2.2 Cultural and heritage aspects

According to the Heritage Impact Assessment (Appendix D5) special attention was given to the identification of possible cultural or heritage resources on site.

Stone Age

Very little habitation of the highveld area took place during Stone Age times. Tools dating to the Early Stone Age period are mostly found in the vicinity of larger watercourses, e.g. the Vaal River, or in sheltered areas such as the mountainous regions north of Klerksdorp and as far east as the Vredefort Dome area. During Middle Stone Age (MSA) times (c. 150 000 – 30 000 BP), people became more mobile, occupying areas formerly avoided. The MSA is a technological stage characterized by flakes and flake-blades with faceted platforms, produced from prepared cores, as distinct from the core tool-based ESA technology. Open sites were still preferred near watercourses.

Late Stone Age (LSA) people had even more advanced technology than the MSA people and therefore succeeded in occupying even more diverse habitats. Also, for the first time we get evidence of people's activities derived from material other than stone tools. Ostrich eggshell beads, ground bone arrowheads, small bored stones and wood fragments with incised markings are traditionally linked with the LSA. The LSA people have also left us with a rich legacy of rock art, which is an expression of their complex social and spiritual believes. A number of sites containing rock engravings are known to exist to the east and south of the site.

Iron Age

Iron Age people started to settle in southern Africa c. AD 300, with one of the oldest known sites at Broederstroom south of Hartebeespoort Dam dating to AD 470. Having only had cereals (sorghum, millet) that need summer rainfall, Early Iron Age (EIA) people did not move outside this rainfall zone, and neither did they occupy the central interior highveld area. Because of their specific technology and economy, Iron Age people preferred to settle on the alluvial soils near rivers for agricultural purposes, but also for firewood and water.

As far as is known, no Early Iron Age sites have yet been identified in the Free State Province. The occupation of the larger geographical area (including the study area) did not start much

before the 1500s. By the 16th century things changed, with the climate becoming warmer and wetter, creating conditions that allowed Late Iron Age (LIA) farmers to occupy areas previously unsuitable, for example the treeless plains of the Free State and the Mpumalanga highveld.

This wet period came to a sudden end sometime between 1800 and 1820 by a major drought lasting 3 to 5 years. The drought must have caused an agricultural collapse on a large, subcontinent scale.

The stone walled settlements dating to the Late Iron Age occur on a wide front over much of the central interior plateau area. In the larger vicinity of the site, these sites conform to Maggs' (1976) type Z settlements. Such site consists mostly of a number of large primary enclosures clustered together, with, associated but on the outside, smaller primary enclosures.

This was also a period of great military tension. Military pressure from Zululand spilled onto the highveld by at least 1821. Various marauding groups of displaced Sotho Tswana moved across the plateau in the 1820s. Mzilikazi raided the plateau extensively between 1825 and 1837. The Boers trekked into this area in the 1830s. And throughout this time settled communities of Tswana people also attacked each other.

As a result of this troubled period, Sotho Tswana people concentrated into large towns for defensive purposes. Because of the lack of trees, they built their settlements in stone. These stone walled villages were almost always located near cultivatable soil and a source of water. Such sites are known to occur north of Klerksdorp and in the Vredefort Dome area.

Historic period

White settlers moved into the area during the first half of the 19th century. They were largely self-sufficient, basing their survival on cattle/sheep farming and hunting. Pretoria was started in 1850, but Johannesburg only dates to the 1880s, after the discovery of gold.

In 1837 the establishment of a trekker settlement at Klerksdorp marked the beginning of a new phase in the history of the region. Originally twelve trekker families settled on the farm Elandsheuvel, belonging to C.M. du Plooy. This settlement, known as 'Oude Dorp', had its first landdros Jacob de Clercq, after which the settlement was then named. In 1853, the name was changed to Klerksdorp. With the discovery of gold in 1886 on the farm Rietpoort, the gold rush gave rise to a new settlement called 'Nieuwe Dorp'. In 1897 the railway line from Krugersdorp reached Klerksdorp. The railway line from Fourteen Streams (Warden region), on the main line from Kimberley to Zimbabwe (Then Rhodesia) was completed in 1906 (SESA 1973).

The town of Orkney was established in 1940 at the junction of the various railway lines. It was named after the old gold mine opened by Thomas Leask, who came from the Orkney Islands, in 1880 (SESA 1973).

Site Specific Review:

From a review of the available old maps and aerial photographs it can be seen that the project area has always been open space, with the main activity being grazing or the making of agricultural fields. No built structures are visible in the site.

No sites, features or objects of cultural significance from the Stone Age, Iron Age or the historic period were identified on site.

Palaeontology

The geology of the proposed Naos Solar PV One Project near Viljoenskroon in the Free Sate is depicted on the 1: 250 000 Wes-Rand 2626 (1986) and 2726 Kroonstad (2000) Geological Map (Council for Geosciences, Pretoria) (Figure 5.29).

According to these geological maps the Naos Solar PV Project One is underlain by Quaternary soils (Qs, yellow) and the Vryheid Formation (khaki, Pv Ecca Group, Karoo Supergroup), while the northern portion is underlain by the Hekpoort (Vh, dark green); Stubenkop (Vs, striated grey-brown) and Daspoort (Vd, purple with black dots) Formations of the Pretoria Group (Transvaal Supergroup). The Pretoria Group sedimentary rocks in and near the study area are extensively intruded, and locally metamorphosed, by sills of diabase (di, green in Figure 5.29). The diabase has no palaeontological significance. However, the existence of the diabase rocks would have had a thermal metamorphic effect on the nearby sediments and would decrease the chance of fossil preservation.

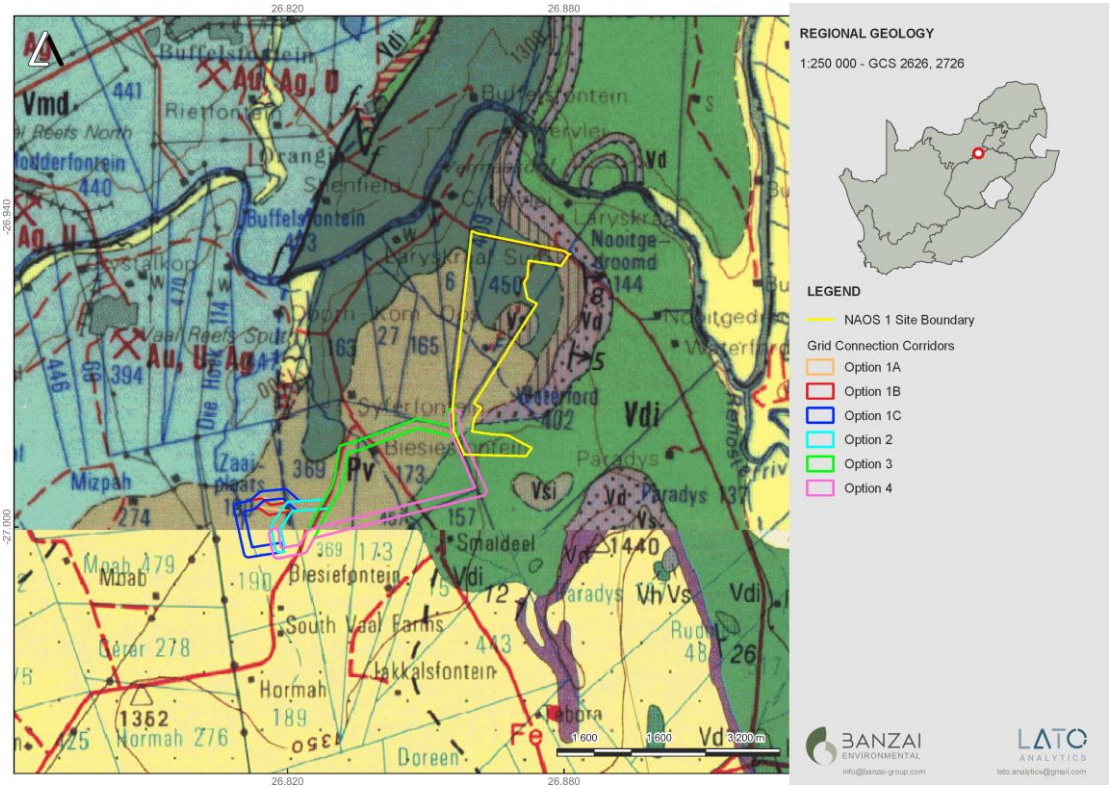


Figure 5.29: Extract of the 1:250 000 Wes-Rand 2626 (1986) and 2726 Kroonstad (2000) Geological Map (Council for Geosciences, Pretoria) indicating the proposed Naos Solar PV One Project near Viljoenskroon in the Free Sate.

According to the PalaeoMap of the South African Heritage Resources Information System (SAHRIS) the Palaeontological Sensitivity of the Quaternary soils and Hekpoort Formations are medium while the Vryheid Formation has a Very high Palaeontological Sensitivity, that of the Daspoort Formation is high while the Stubenkop Formation has a Low Sensitivity. The diabase has a Zero Sensitivity. Refer to Figure 5.30.

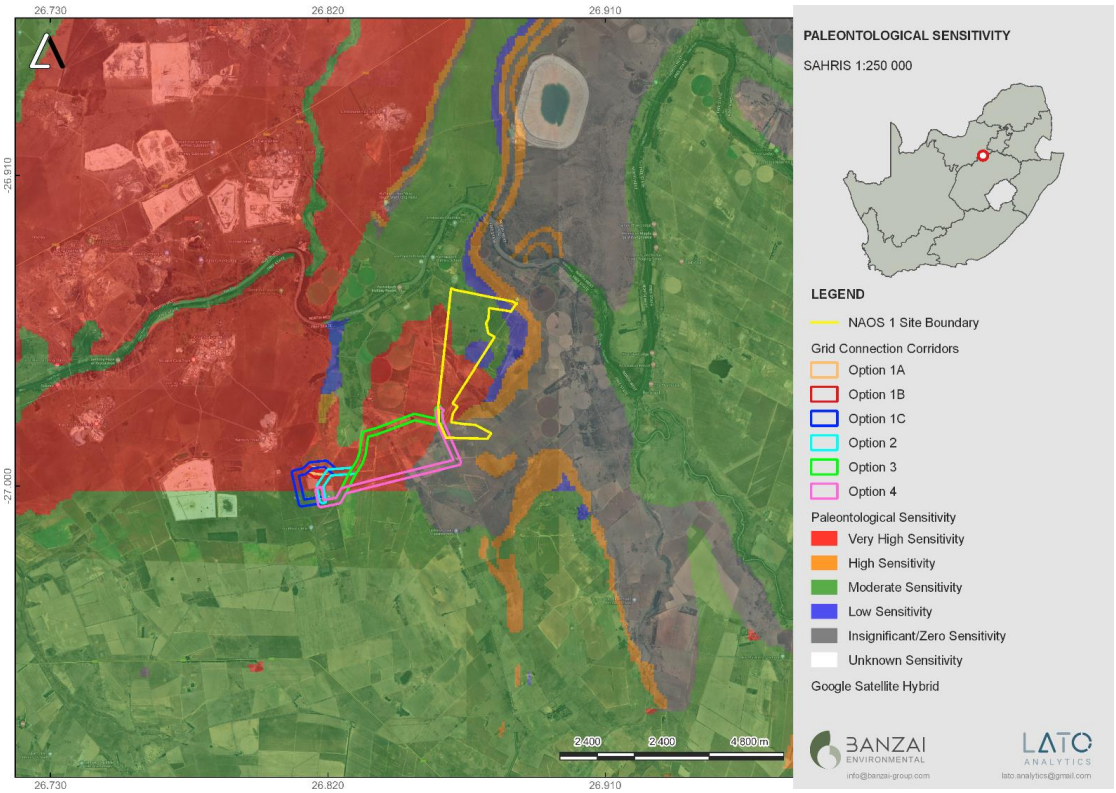


Figure 5.30: Extract of the 1 in 250 000 SAHRIS PalaeoMap map (Council of Geosciences) indicating the Naos Solar PV One Project and grid connection alternatives near Viljoenskroon in the Free State.

The geology has recently been updated (Council of Geosciences, Pretoria) and indicates that the proposed Naos PV One Project is underlain by the following sediments (Figure 5.30) Vryheid Formation (Ecca Group) and the Hekpoort, Boshoek and Daspoort Formations (Pretoria Group) as well as the Malmani Subgroup (Chuniespoort Group). The most eastern portion of the development is underlain by intrusive diabase rocks that has no Palaeontological Significance. The grid connection is underlain by Vryheid Formation, diabase as well as the Malmani Subgroup. Refer to Figure 5.31.

The updated geology also indicates that the Malmani Subgroup of the Chuniespoort Group (Transvaal Supergroup) is present in the development. The Pretoria Group sedimentary rocks in and near the study area are extensively intruded, and locally metamorphosed, by sills of diabase. The diabase has a Zero Palaeontological Sensitivity. However, the existence of the diabase rocks would have had a thermal metamorphic effect on nearby sediments and would decrease the chance of fossil preservation.

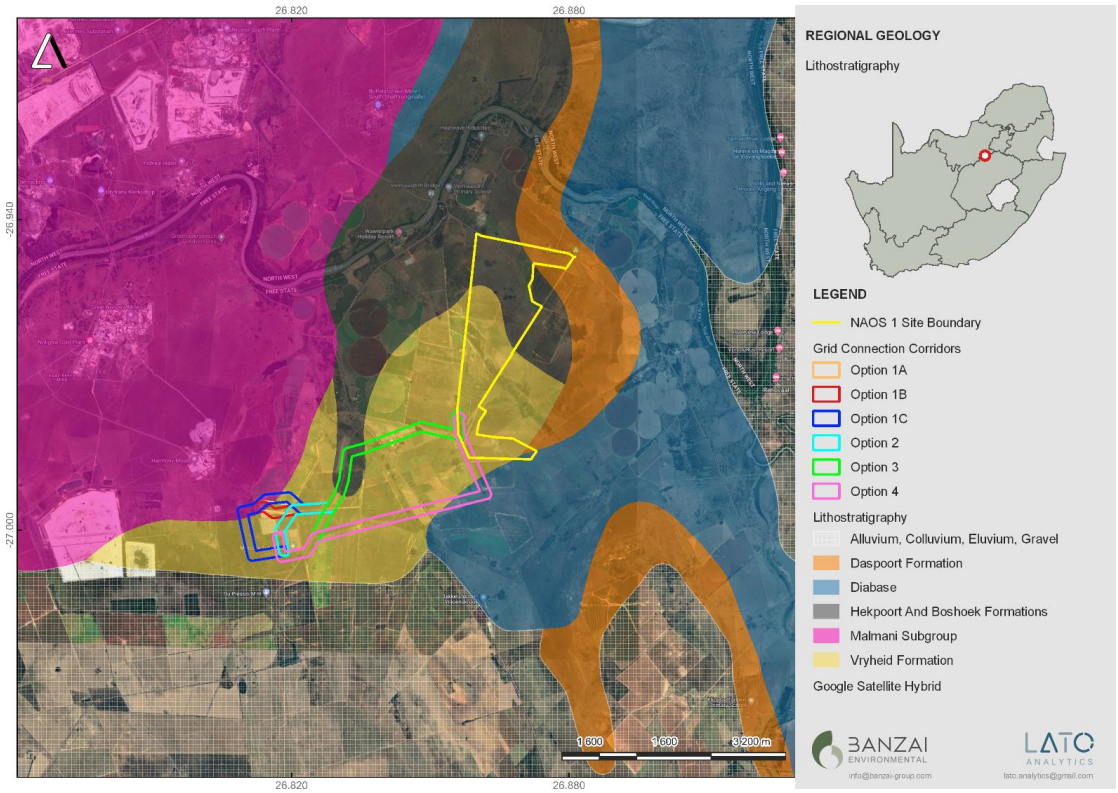


Figure 5.31: Updated Geology (Council of Geosciences, Pretoria) of the proposed Naos Solar PV One Project and grid connection near Viljoenskroon in the Free Sate

A site-specific field survey of the development footprint was conducted on foot and by motor vehicle on 13 August 2022. No fossiliferous outcrops were identified during the site visit. The development has a flat topography and is used for agriculture.

5.4 SITE SELECTION MATRIX

Due to the nature of the proposed development, the location of the facility is largely dependent on technical and environmental factors such as solar irradiation, climatic conditions, topography of the site, access to the grid and capacity of the grid. Studies of solar irradiation worldwide indicate that the Free State Province has a huge potential for the generation of power from solar.

The receptiveness of the site to PV development includes the presence of optimal conditions for the siting of a solar energy facility due to high irradiation values and optimum grid connection opportunities. The site where the project is proposed to be located is considered favourable and suitable from a technical perspective due to the following characteristics:

- **Climatic conditions:** Climatic conditions determine if the project will be viable from an economic perspective as the solar energy facility is directly dependent on the annual direct solar irradiation values of a particular area. The Free State receives a high average of direct normal and global horizontal irradiation daily. This is an indication that the regional location of the project includes a low number of rainy days and a high number of daylight hours experienced in the region. Global Horizontal Radiation of 2118 kwh/m^2 per year is relevant in the area.

- **Renewable Energy Development Zone (REDZ):** The site is also located in the Klerksdorp Renewable Energy Development Zones (REDZ). The solar PV assessment domain was based on the location of the majority of existing solar PV project applications at the commencement of the Strategic Environmental Assessment (SEA) and includes the five provinces of Northern Cape, Western Cape, Eastern Cape, Free State and North West.

- **Site availability and access:** The land is available for lease by the developer and consent has been provided by the affected landowner for the undertaking of the BA process on the affected property. Reluctant farm owners or farmers over capitalizing hamper efforts to find suitable farms. Access will be obtained via the existing Vermaasdrift Road, R59, R501 and S643 roads.

- **Grid connection**: Connecting the array to the electrical grid requires the transformation of the voltage from 33kV to 132kV. The normal components and dimensions of a distribution-rated electrical substation will be required. A collector substation with a capacity of 33kV/132kV will also be required.

  The onsite substation will be required on site to step the voltage up to 33kV/132kV, after which the power will be evacuated into the national grid via the new proposed power line from the proposed collector substation to the 132/400kV Mercury Main Transmission Substation (MTS).

  Two collector substation alternative locations are under assessment. Specific internal power lines to connect the collector substation to the main grid connection corridor, which will ultimately evacuate the generated power into the national grid, is also being proposed as part of the required grid connection infrastructure.

  The capacity of the collector substation will be 33kV/132kV and the capacity of the internal power lines will be 33kV/132kV.

  The 132kV power line to connect the facility to the 132/400kV Mercury Main Transmission Substation is under assessment within a 200m wide grid connection corridor. Six alternative routes are being considered.

  Available grid connections are becoming scarce and play a huge role when selecting a viable site.

- **Environmental sensitivities:** From an environmental perspective the proposed site/development footprint is considered desirable due to limited environmental sensitivities in terms of geology, soils, vegetation and landscape features, climate, biodiversity and ecological features and the visual landscape – refer to Section 5.3.1 of this report. Where ecological features and habitats have been identified the ecological specialist has advised that development within these areas are appropriate subject to the implementation of strict mitigation measures. The Wetland Impact Assessment recommends specific mitigation measures for the placement of infrastructure in or near the wetlands identified. It must be noted that the artificial dam located within the development footprint has not been identified as a no-go are

by the wetland specialist. Areas under crop production within the site are being considered for the placement of infrastructure, as per the motivation provided for in the Agricultural Economic Assessment (Appendix D9), which indicates the benefits associated with the development for the currently agricultural activities as well as future agricultural expansion for the landowner. Where the landowner has indicated that areas need to be avoided on the affected property in this regard, the site has been identified such that those areas are excluded from the assessment.

It is evident from the discussion above that the site and development footprint under assessment may be considered favourable and suitable in terms of these site characteristics, as limited sensitive environmental features are present within the affected property. As mentioned previously, no alternative areas within the affected property have been considered.

5.5 CONCLUDING STATEMENT ON ALTERNATIVES

When considering the information provided by the specialists with regards to the site selection criteria, the site is identified as preferred due to the fact that the opportunities presented on the site to develop the project in such a way which will be appropriate from an environmental perspective.

Therefore, development of the 300MW Naos Solar PV Project One on Portion 1 of the Farm Waterford No. 573 is the preferred option. The preferred layout included in the attached Appendix H. It is therefore concluded that no other alternatives are considered as part of the BA process.

A comparative assessment is included in Section 6.5 of this draft Basic Assessment Report.

6 DESCRIPTION OF THE IMPACTS AND RISKS

This section aims to address the following requirements of the regulations:

Appendix 1. (3)(i) An BAR (...) must include-

(i) a full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred location through the life of the activity, including-

(i) a description of all environmental issues and risks that were identified during the EIA process; and

(ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures.

(j) an assessment of each identified potentially significant impact and risk, including-

(i) cumulative impacts;

(ii) the nature, significance and consequences of the impact and risk;

(iii) the extent and duration of the impact and risk;

(iv) the probability of the impact and risk occurring;

(v) the degree to which the impact and risk can be reversed;

(vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and

(vii) the degree to which the impact and risk can be mitigated;

(k) where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final report;

6.1 SCOPING METHODOLOGY

The contents and methodology of the basic assessment report aimed to provide, as far as possible, a user-friendly analysis of information to allow for easy interpretation.

- Checklist (see section 6.1.1): The checklist consists of a list of structured questions related to the environmental parameters and specific human actions. They assist in ordering thinking, data collection, presentation and alert against the omission of possible impacts.
- Matrix (see section 6.1.2): The matrix analysis provides a holistic indication of the relationship and interaction between the various activities, development phases and the impact thereof on the environment. The method aims at providing a first order cause and effect relationship between the environment and the proposed activity. The matrix is designed to indicate the relationship between the different stressors and receptors which leads to specific impacts. The matrix also indicates the specialist studies that have been conducted to address the potentially most significant impacts.

6.1.1 Checklist analysis

The independent consultant conducted a site visit on 20 July 2022. The site visit was conducted to ensure a proper analysis of the site specific characteristics of the site. Table 6.1 provides a checklist, which is designed to stimulate thought regarding possible consequences of specific actions and to assist in the scoping of key issues. It consists of a list of structured questions related to the environmental parameters and specific human actions. They assist in ordering thinking, data collection, presentation and alert against the omission of possible impacts. The table highlights certain issues, which are further analysed in matrix format in section 6.2.

Table 6.1: Environmental checklist

QUESTION	YES	NO	Un-sure	Description
1. Are any of the following located on the site earmarked for the development?				
I. A river, stream, dam or wetland	✕			Vaal River is located 1.3km to the north of the site. An exorheic depression wetland (artificial dam) is located within the site, and two unchanneled valley bottom wetlands are located within the six grid connection corridor alternatives.
II. A conservation or open space area	✕			The northern section of the site includes the presence of a CBA 1 area, however this area has been somewhat transformed due to the agricultural activities which have been undertaken over the site in recent time and historically. ESA 1 and ESA 2 areas are also presents, as well as degraded and other natural areas. The site is located within a priority focus area of the National Protected Area Expansion Strategy (NPAES).
III. An area that is of cultural importance		✕		None.
IV. Site of geological/palaeontological significance		✕		None.
V. Areas of outstanding natural beauty		✕		None. The area is mainly used for agricultural activities and mining.

VI. Highly productive agricultural land	×			Areas under crop production are present within the site. Discussions were held with the farmers which indicated that they still want to better the production of the farm by adding a solar energy facility and building a new irrigation dam that will be filled with water pumped from the Vaal River and using gravitation to irrigate the planned fields.
VII. Floodplain	×			Vaal River is located 1.3km to the north of the site.
VIII. Indigenous Forest		×		None.
IX. Grass land	×			The site falls within the Endangered Vaal-Vet Sandy Grassland and Vulnerable Rand Highland Grassland vegetation units.
X. Bird nesting sites		×		None.
XI. Red data species	×			*Crinum bulbispermum* (declining) has been observed in the *Vachellia karroo– Asparagus laricinus* woodland vegetation unit of the site.
XII. Tourist resort		×		None.
2. Will the project potentially result in potential?				
I. Removal of people		×		None.
II. Visual Impacts	×			The VIA (refer to Appendix D3) confirmed that the development will have a negative low visual impact on observers. The only receptors likely to be impacted by the proposed development are the nearby property owners and nearby roads. However, a large part of the visual landscape is still reflecting a farming and intensive mining landscape with a much lower visual quality.

III. Noise pollution		×		Construction activities will result in the generation of noise over a period of months (up to 18 months), therefore the impact will be temporary. However, there are mines located in the surroundings of the site. The noise impact is therefore insignificant in comparison to the noise generated by the mining operations and will only be temporary in nature.
IV. Construction of an access road	×			Access will be obtained via the existing Vermaasdrift Road, R59, R501 and S643 roads. Internal access roads will be constructed for the facility.
V. Risk to human or valuable ecosystems due to explosion/fire/ discharge of waste into water or air.		×		None. The proposed BESS will be assembled off site and will be transported to site to be installed.
VI. Accumulation of large workforce (>50 manual workers) into the site.	×			Approximately 1000 employment opportunities will be created during the construction and ~25 during the operational phases.
VII. Utilisation of significant volumes of local raw materials such as water, wood etc.	×			The estimated maximum amount of water required during construction is ~70000 kilolitres per year (during a construction period of up to 18 months). During operation of the facility ~4000 kilolitres per year for up to 30-year period will be required.
VIII. Job creation	×			Approximately 1000 employment opportunities will be created during the construction and ~25 during the operational phases.

IX. Traffic generation	×			Additional traffic will be generated during both the construction and operation phases, with majority of trips expected during the construction phase related to the transport of machinery and equipment, as well as employees. This will however differ during the different stages of construction.
X. Soil erosion	×			The site will need to be cleared or graded, which may potentially result in a degree of dust being created, increased runoff and potentially soil erosion. The time that these areas are left bare will be limited to the construction phase, since vegetation will be allowed to grow back after construction. No existing areas of erosion was identified. Most of the soils present within the site has a moderate potential for soil erosion. However, Glenrosa and Katspruit have a high potential and Mispah a very high potential.
XI. Installation of additional bulk telecommunication, transmission lines or facilities	×			There is existing Eskom infrastructure in the area and the solar facility will require the development of power lines. A telecommunication facility is located approximately 1km to the southeast of the site.
3. Is the proposed project located near the following?				
I. A river, stream, dam or wetland	×			Vaal River is located 1.3km to the north of the site. Exorheic depression wetlands (artificial dams) are located to the east of the site, and two unchanneled valley bottom wetlands are located within the six grid connection corridor alternatives.

II. A conservation or open space area	×			The project is located within 5km of two protected areas in terms of NEMPAA, known as Mispha Game Farm located approximately 1.8km west of the PV site and 530m west of the grid connection corridors and the Bushbaby Private Nature Reserve located approximately 1.45 km northeast of the proposed development.
III. An area that is of cultural importance		×		None.
IV. A site of geological/palaeontological resources significance		×		None.
V. An area of outstanding natural beauty		×		None.
VI. Highly productive agricultural land	×			Agricultural activities, including crop production, are undertaken within the surrounding areas of the site.
VII. A tourist resort	×			The Wawielpark Holiday Resort is located ~1.7km west of the site. The Clementia Function and Conference Venue is located ~900m northwest of the site. The Seekoeigat Camping ground is located directly to the east of the site.
VIII. A formal or informal settlement	×			The town of Viljoenskroon is located approximately 24km to the south and the town of Orkney is located approximately 12km east of the proposed development.

6.1.2 Matrix analysis

The matrix describes the relevant listed activities, the aspects of the development that will apply to the specific listed activity, a description of the environmental issues and potential impacts, the significance and magnitude of the potential impacts and possible mitigation measures. The matrix also highlights areas of particular concern (see Table 6.3). An indication is provided of the specialist studies which were conducted and that informed the assessment. The nature of the impact, duration and its significance – should no mitigation measures be applied, is considered. This is important since many impacts would not be considered significant if proper mitigation measures were implemented.

In order to conceptualise the different impacts, the matrix specify the following:

- **Stressor**: Indicates the aspect of the proposed activity, which initiates and cause impacts on elements of the environment.
- **Receptor**: Highlights the recipient and most important components of the environment affected by the stressor.
- **Impacts**: Indicates the net result of the cause-effect between the stressor and receptor.
- **Mitigation**: Impacts need to be mitigated to minimise the effect on the environment.

Detailed impact assessments have been undertaken by each of the respective specialists which has informed the matrix analysis as included in Table 6.3, as well as the key issues identified as included in sections 6.2.1-6.2.3. The Table 6.2 includes reference to the sections in the respective specialist studies where the details of the in-depth assessment of potential environmental impacts can be obtained, which has informed the matrix analysis.

Table 6.2: Reference to the sections in the respective specialist studies where the details of the in-depth assessment of potential environmental impacts can be obtained

Specialist Study	**Impact Assessment (pg.)**	**Cumulative Impacts (pg.)**	**Mitigation Measures (pg.)**
Terrestrial Biodiversity Impact Assessment (Appendix D1)	53-70	70-73	53-70
Avifauna Impact Assessment (Appendix D2)	Solar Facility: 39-43 Power Line: 24-27	Solar Facility: 39-43 Power Line: 24-27	Solar Facility: 43-44 Power Line: 27-28
Visual Impact Assessment (Appendix D3)	76-107	102-106	76-107
Soil and Agricultural Impact Assessment (Appendix D4)	28-34	32 & 34	35-37
Heritage Impact Assessment (Appendix D5)	16-21	16-20	21-23
Palaeontological Impact Assessment (Appendix D6)	24-30	24-30	30-32
Social Impact Assessment (Appendix D7)	71-104	71-104	71-108
Wetland Impact Assessment (Appendix D8)	41-47	37-40	41-47

Table 6.3: Matrix analysis

For ease of reference the significance of the impacts is colour-coded as follow:

Low significance	Medium significance	High significance	Positive impact

LISTED ACTIVITY (The Stressor)	ASPECTS OF THE DEVELOPMENT /ACTIVITY		POTENTIAL IMPACTS		SIGNIFICANCE AND MAGNITUDE OF POTENTIAL IMPACTS							MITIGATION OF POTENTIAL IMPACTS			SPECIALIST STUDIES / INFORMATION
			Receptors	Impact description / consequence	Minor	Major	Extent	Duration	Probability	Reversibility	Irreplaceable loss of resources	Possible Mitigation	Possible mitigation measures	Level of residual risk	
CONSTRUCTION PHASE															
Activity 11(i) (GNR 327): *"The development of facilities or infrastructure for the transmission and distribution of electricity outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts."* Activity 12(ii)(a)(b) (GNR 327): *"The development of (ii) infrastructure or structures with a physical footprint of 100 square meters or more where such development occurs (a) within a watercourse or (b) within 32 meters of a watercourse, measured*	Site clearing and preparation Certain areas of the site will need to be cleared of vegetation and some areas may need to be levelled. Civil works The main civil works are: • Terrain levelling if necessary– Levelling will be minimal as the potential site chosen is relatively flat. • Laying foundation- The structures will be connected to the ground through cement pillars, cement slabs or metal screws. The exact method will depend on	BIOPHYSICAL ENVIRONMENT	Fauna & Flora	• Direct habitat destruction • Habitat fragmentation • Increased soil erosion and sedimentation • Soil and water pollution • Air pollution • Spread and establishment of alien invasive species • Negative effect of human activities on fauna and road mortalities		-	S/L	M/ L	D/ Pr/ Po	PR /CR	ML	Yes	• See Table 6.4	L	Terrestrial Biodiversity Impact Assessment (Appendix D1)
			Wetland/ Riparian areas	• Compaction, soil erosion and sedimentations • Disturbance of watercourse habitat and fringe vegetation • Soil and water pollution • Spread and establishment of alien invasive species		-	S/L	L	D	BR	SL	Yes	• See Table 6.4	L	Wetland Impact Assessment (Appendix D8)
			Avifauna	• Loss of priority avian species from important habitats • Loss of resident avifauna through increased disturbance • Long-term or permanent degradation and modification of the receiving environment resulting to		-	S	M/ L	Pr	PR/ BR	ML/ SL	Yes	• See Table 6.4	L	Avifaunal Impact Assessment (Appendix D2)

from the edge of a watercourse. Activity 14 (GNR 327): *"The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres."* Activity 19 (GNR 327): *"The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic meters from a watercourse."* Activity 24 (ii) (GN.R 327): *"The development of a road (ii) with reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 meters"* Activity 28 (ii) (GN.R 327): *"Residential, mixed, retail, commercial, industrial or institutional*	the detailed geotechnical analysis. • Construction of access and inside roads/paths – existing paths will be used were reasonably possible. Additionally, the turning circle for trucks will also be taken into consideration. Transportation and installation of PV panels into an Array The panels are assembled at the supplier's premises and will be transported from the factory to the site on trucks. The panels will be mounted on metal structures which are fixed into the ground either through a concrete foundation or a deep-seated screw. The BESS and grid connection corridor infrastructure will also be installed and constructed. Wiring to the Central Inverters Sections of the PV array would be wired to central inverters. The inverter converts DC electricity to alternating electricity (AC) at grid frequency.			in the loss of important avian habitats										
			Air	• Air pollution due to the increase of traffic of construction vehicles and the undertaking of construction activities. • Ecosystem damage due to pollutants and dust	-		S	S	D	CR	NL	Yes	• A speed limit should be enforced on dirt roads (preferably 30-40km/h). • Implement standard dust control measures, including periodic spraying (frequency will depend on many factors including weather conditions, soil composition and traffic intensity and must thus be adapted on an on-going basis) of construction areas and access roads, and ensure that these are continuously monitored to ensure effective implementation.	L	Terrestrial Biodiversity Impact Assessment (Appendix D1)
			Soil and Agriculture	• Loss of land capability during the construction phase – PV Facility • Loss of land capability during the construction phase – Grid Connection		-	S/ L	S/ M	Pr	CR	NL	Yes	• See Table 6.4	L	Soil and Agricultural Impact Assessment (Appendix D4)
			Existing services infrastructure	• Generation of waste that needs to be accommodated at a licensed landfill site. • Generation of sewage that need to be accommodated by the local sewage plant. • Increase in construction vehicles on existing roads.		-	L	S	D	PR	ML	Yes	-	L	Confirmation from the Local Municipality required to confirm capacity for services
			Groundwater	• Pollution due to construction vehicles and the storage and handling of dangerous goods.	-		S	S	Pr	CR	ML	Yes	• Monitoring boreholes should be securely capped (where used), and must be fitted with a suitable sanitary seal to prevent surface water flowing down the outside of the casing. Full construction details of monitoring boreholes must be recorded when they are drilled (e.g. screen and casing lengths, diameters, total depth, etc). • Sampling of monitoring boreholes should be done according to recognised standards.	L	-

developments where such land was used for agriculture or afforestation on or after 1998 and where such development (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare." <u>Activity 56 (ii) (GN.R 327):</u> *"The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre (ii) where no reserve exists, where the existing road is wider than 8 metres…"* <u>Activity 1 (GN.R 325):</u> *"The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more."* <u>Activity 15 (GN.R 325):</u> *"The clearance of an area of 20 hectares or more of indigenous vegetation."* <u>Activity 4 (b)(i)(bb)(ee)(gg) (GN.R 324):</u> *"The development*												• Where pollution occurs this must be reported and cleaned-up in an appropriate manner as soon as possible.		
			General Environment (risks associated with BESS)	• Mechanical breakdown / Exposure to high temperatures • Fires, electrocutions and spillage of toxic substances into the surrounding environment. • Spillage of hazardous substances into the surrounding environment. • Soil contamination – leachate from spillages which could lead to an impact of the productivity of soil forms in affected areas. • Water Pollution – spillages into surrounding watercourses as well as groundwater. • Health impacts – on the surrounding communities, particularly those relying on watercourses (i.e. rivers, streams, etc) as a primary source of water. • Generation of hazardous waste		-	S	M	Pr	PR	ML	Yes	• Operators are trained and competent to operate the BESS. Training should include the discussion of the following: - Potential impact of electrolyte spills on groundwater; - Suitable disposal of waste and effluent; - Key measures in the EMPr relevant to worker's activities; - How incidents and suggestions for improvement can be reported. • Training records should be kept on file and be made available during audits. • Battery supplier user manuals safety specifications and Material Safety Data Sheets (MSDS) are filed on site at all times. • Compile method statements for approval by the Technical/SHEQ Manager for the operation and management and replacement of the battery units / electrolyte for the duration of the project life cycle. Method statements should be kept on site at all times. • Provide signage on site specifying the types of batteries in use and the risk of exposure to hazardous material and electric shock. Signage should also specify how electrical and chemical fires should be dealt with by first responders, and the potential risks to first responders (e.g. the inhalation of toxic fumes, etc.).	L	-

of a road wider than 4 metres with a reserve less than 13,5 metres (b) in the Free State, (i) outside urban areas and within (bb) National Protected Area Expansion Strategy, (ee) critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans and (gg) areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding disturbed areas." <u>Activity 10 (b)(i)(bb)(ee)(gg)(hh) (GN.R 324):</u> *"The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres (b) in the Free State (i) outside*												• Firefighting equipment should readily be available at the BESS area and within the site. • Maintain strict access control to the BESS area. • Ensure all maintenance contractors / staff are familiar with the supplier's specifications. • Undertake a risk assessment prior to the commencement of general checks and maintenance tasks at the BESS. This should consider any aspects which could result in fire or spillage, and appropriate actions should be taken to prevent these. • Standard Operating Procedures (SOPs) should be made available by the Supplier to ensure that the batteries are handled in accordance with required best practices. • Spill kits must be made available to address any incidents associated with the flow of chemicals from the batteries into the surrounding environment. • The assembly of the batteries on-site should be avoided as far as possible. Activities on-site for the BESS should only be limited to the placement of the container wherein the batteries are placed. • Undertake periodic inspections on the BESS to ensure issues are identified timeously and addressed with the supplier where relevant. • The applicant in consultation with the supplier must compile and implement a Leak and Detection Monitoring Programme during the project life cycle of the BESS. • Batteries must be strictly maintained by the supplier or suitably qualified persons for the duration of the project life cycle.		

urban areas and within (bb) National Protected Area Expansion Strategy, (ee) Critical Biodiversity Areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans, within (gg) areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding disturbed areas and (hh) Areas within a watercourse or wetland, or within 100 metres from the edge of a watercourse or wetland." <u>Activity 12 (b)(i)(ii)(iv) (GN.R 324):</u> *"The clearance of an area of 300 square metres or more of indigenous vegetation (b) in the Free State (i) within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically*												No unauthorised personnel should be allowed to maintain the BESS. • Damaged and used batteries must be removed from site by the supplier or any other suitably qualified professional for recycling or appropriate disposal. • The applicant should obtain a cradle to grave battery management plan from the supplier during the planning and design phase of the system. The plan must be kept on site and adhered to.		
		SOCIAL/ECONOMIC ENVIRONMENT	Positive social Impacts	• Creation of direct and indirect employment and skills development opportunities. • Economic multiplier effects • Improvements to shared infrastructure		+	L/R	S	D/ Pr	CR	NL	Yes	• See Table 6.4	M	Social Impact Assessment (Appendix D7)
			Visual landscape	• Construction impacts of the PV facility. • Construction impacts of power line alternatives 1A, 1B, 1C, 2 and 3. • Construction impacts of power line alternative 4.		-	L	S	D/ Pr	PR	ML	Yes	• See Table 6.4	L	Visual Impact Assessment (Appendix D3)
			Traffic volumes	• Traffic Congestion • Increase in traffic volumes • Impact on road safety	-		N	S	D	CR	NL	Yes	• Stagger component delivery to site. • Reduce the construction period. • The use of mobile batch plants and quarries in close proximity to the site. • Staff and general trips should occur outside of peak traffic periods. • Regular maintenance of gravel roads by the Contractor during the construction phase and by Client/Facility Manager during operation phase • All construction vehicles must be roadworthy and drivers must have the relevant licenses for the type of vehicles they are operating.	M	-

endangered in the National Spatial Biodiversity Assessment 2004, (ii) within critical biodiversity areas identified in bioregional plans and (iv) areas within a watercourse or wetland; or within 100 metres from the edge of watercourse or wetland." <u>Activity 14 (ii)(a)(c)(b)(i)(bb)(ff)(hh) (GN.R 324):</u> *"The development of (ii) infrastructure or structures with a physical footprint of 10 square metres or more where such development occurs (a) within a watercourse; or (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; in the (b) Free State Province, (i) outside urban areas, within (bb) National Protected Area Expansion Strategy, (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans and*												• All vehicle drivers need to strictly adhere to the rules of the road.		
			Negative social impacts	• Potential loss of productive farmland • In-migration of people (non-local workforce and jobseekers) • Impacts on safety and security. • Impacts on daily movement patterns. • Nuisance impacts (noise and dust). • Increased risk of veld fires. • Visual and sense of place impacts		-	S/ L	S/ P	Pr / D	BR / Cr / IR	ML / SL	Yes	• See Table 6.4	L	Social Impact Assessment (Appendix D7)
			Noise levels	• The generation of noise as a result of construction vehicles, the use of machinery such as drills and people working on the site.		-	L	S	D	CR	NL	Yes	• See Table 6.4	L	Social Impact Assessment (Appendix D7)
			Tourism industry	• The Wawielpark Holiday Resort is located ~1.7km west of the site. The Clementia Function and Conference Venue is located ~900m northwest of the site. The Seekoeigat Camping ground is located directly to the east of the site. There may be a nuisance impact and safety and security impact for these facilities.		-	L	S	D	CR	ML	Yes	• See Table 6.4	L	-
			Heritage resources	• As no sites, features or objects of cultural historic significance have been identified in the site, there would be no impact as a result of the proposed development.	-		S	S	U	CR	NL	Yes	• See Table 6.4	L	Heritage Impact Assessment (Appendix D5)
			Paleontological Heritage	• Loss of fossil heritage • Destroy or permanently seal-in fossils at or below the surface that are then no longer available for scientific study		-	S	P	U	BR	SL	Yes	• See Table 6.4	L	Paleontological Impact Assessment (Appendix D6)

(hh) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve." <u>Activity 18 (b)(i)(bb)(ee)(gg)(hh) (GN.R 324):</u> *"The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre (b) in the Free State (i) outside urban areas, within (bb) National Protected Area Expansion Strategy, (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans, (gg) areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding disturbed areas and (hh) Areas within a watercourse or wetland; or within 100 metres from the edge of*														

a watercourse or wetland."														
OPERATIONAL PHASE														
Activity 11(i) (GNR 327): *"The development of facilities or infrastructure for the transmission and distribution of electricity outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts."* Activity 14 (GNR 327): *"The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres."* Activity 28 (ii) (GN.R 327): *"Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 1998 and where such development (ii) will*	The key components of the proposed project are described below: PV Panel Array - To produce up to 300MW the facility will require numerous linked cells placed behind a protective glass sheet to form a panel. Multiple panels will be required to form the solar PV arrays which will comprise the PV facility. Battery Energy Storage System (BESS) – The battery energy storage system will make use of Lithium-ion (Lithium Iron Phosphate / Sodium Sulphur) or Vanadium Redox technology and will have a capacity of up to 4.5GWh. The extent of the system will be ~4.57ha. It must be noted that should the facility layout not require the development and operation of a BESS, the area allocated for the placement of the BESS will be used for panel placement within the development footprint. Inverters - Sections of the PV array will be wired to inverters. The inverter is a	BIOPHYSICAL ENVIRONMENT	Fauna & Flora	• Direct habitat destruction • Habitat fragmentation • Increased soil erosion and sedimentation • Soil and water pollution • Air pollution • Spread and establishment of alien invasive species • Negative effect of human activities on fauna and road mortalities		-	S/L	M/ L	D/ Pr/ Po	PR /CR	ML	Yes	• See Table 6.5	L	Terrestrial Biodiversity Impact Assessment (Appendix D1)
			Avifauna	• Long-term or permanent degradation and modification of the receiving environment resulting to in the loss of important avian habitats. • Loss of resident avifauna through increased disturbance. • Collisions with PV panels and electrocution risks leading to injury or loss of avian life which decreases avifauna species diversity. • Collisions with overhead power lines and electrocution risks leading to injury or loss of avian life which decreases avian diversity		-	S	L / M	Pr	BR/ PR	ML / SL	Yes	• See Table 6.5	L	Avifaunal Impact Assessment (Appendix D2)
			Air quality	• The proposed development will not result in any air pollution during the operational phase.	N/ A	N/ A	N/ A	N/ A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Soil and Agriculture	• Loss of land capability during the construction phase – PV Facility • Loss of land capability during the construction phase – Grid Connection		-	S	S	Pr	CR	NL	Yes	• See Table 6.5	L	Soil and Agricultural Impact Assessment (Appendix D4)
			Groundwater	• Leakage of hazardous materials. The development will comprise of a distribution substation and switching station and collector	-		L	L	Po	PR	ML	Yes	• All areas in which substances potentially hazardous to groundwater are stored, loaded, worked with or disposed of should	L	-

occur outside an urban area, where the total land to be developed is bigger than 1 hectare." Activity 1 (GN.R 325): *"The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more."* Activity 10 (b)(i)(bb)(ee)(gg)(hh) (GN.R 324): *"The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres (b) in the Free State (i) outside urban areas and within (bb) National Protected Area Expansion Strategy, (ee) Critical Biodiversity Areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans,*	pulse-width mode inverter that converts direct current (DC) electricity to alternating current (AC) electricity at grid frequency. Connection to the grid - Connecting the array to the electrical grid requires the transformation of the voltage from 33kV to 132kV. The normal components and dimensions of a distribution-rated electrical substation will be required. A collector substation with a capacity of 33kV/132kV will also be required. The onsite substation will be required on site to step the voltage up to 33kV/132kV, after which the power will be evacuated into the national grid via the new proposed power line from the proposed collector substation to the 132/400kV Mercury Main Transmission Substation (MTS). Specific internal power lines to connect the collector substation to the main grid connection corridor, which will ultimately evacuate the generated power into the national grid, is also being	SOCIAL/ECONOMIC		substation and will include transformer bays which will contain transformer oils. Leakage of these oils can contaminate water supplies.									be securely bunded (impermeable floor and sides) to prevent accidental discharge to groundwater.		
			Wetland/ Riparian areas	• Compaction, soil erosion and sedimentations • Disturbance of watercourse habitat and fringe vegetation • Soil and water pollution • Spread and establishment of alien invasive species		-	S/L	L	D	BR	SL	Yes	• See Table 6.5	L	Wetland Impact Assessment (Appendix D8)
			Visual landscape	• Potential visual impacts on sensitive visual receptors located within a 1km radius from the solar facility. • Potential visual impacts on sensitive visual receptors located within a 1km radius from the grid connection corridor alternatives 1A, 1B, 1Cc, 2 and 3. • Potential visual impacts on sensitive visual receptors located within a 1km radius from the grid connection corridor alternative 4. • Potential visual impacts on sensitive visual receptors between a 1km and 3km radius from the solar facility. • Potential visual impacts on sensitive visual receptors between a 1km and 3km radius from the 1A, 1B, 1C, 2 and 3. • Potential visual impacts on sensitive visual receptors between a 1km and 3km radius from the grid connection corridor alternative 4. • Potential visual impacts on sensitive visual receptors between a 3km and 5km radius from the solar facility. • Potential visual impacts on sensitive visual receptors between a 3km and 5km radius from the grid connection		-	L	L	Pr / Po	PR / CR	ML /NL / SL	Yes	• See Table 6.5	L	Visual Impact Assessment (Appendix D3)

within (gg) areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding disturbed areas and (hh) Areas within a watercourse or wetland, or within 100 metres from the edge of a watercourse or wetland."	proposed as part of the required grid connection infrastructure. <u>Electrical reticulation network</u> – An internal electrical reticulation network will be required and will be lain ~2-4 m underground as far as practically possible. <u>Supporting Infrastructure</u> – The following auxiliary buildings with basic services including water and electricity will be required on the site: • Operations & Maintenance Building / Office (~2510m²); • Switch gear and relay room (~800m²); • Staff lockers and changing room (~200m²); • Security control (~60m²); • Permanent Laydown Area (~10ha); and • Temporary batching plant <u>Roads</u> – Access will be obtained via the existing Vermaasdrift Road, R59, R501 and S643 roads. Four alternative main access routes are being considered (the preferred route will be determined by the local and / or national roads authorities during the site			corridor alternatives 1A, 1B, 1C, 2 and 3. • Potential visual impacts on sensitive visual receptors between a 3km and 5km radius from the grid connection corridor alternative 4. • Potential visual impacts on sensitive visual receptors located between a 5km and 10km radius from the solar facility. • Potential visual impacts on sensitive visual receptors located between a 5km and 10km radius from the grid connection corridor alternatives 1A, 1B, 1C, 2 and 3. • Potential visual impacts on sensitive visual receptors located between a 5km and 10km radius from the grid connection corridor alternative 4. • Lighting Impacts of the solar facility. • Solar glint and glare impacts of the solar facility. • Visual and sense of place impacts of the solar facility. • Visual and sense of place impacts of the grid connection corridor alternatives 1A, 1B, 1C, 2 and 3. • Visual and sense of place impacts of the grid connection corridor alternative 4.										
			Traffic volumes	• The proposed development will not result in any major traffic impacts during the operational phase.	-		S	L	Po	PR	NL	Yes	• All operations and maintenance vehicles must be roadworthy and drivers must have the relevant licenses for the type of vehicles they are operating. • All vehicle drivers need to strictly adhere to the rules of the road.	L	-
			Heritage resources	• As no sites, features or objects of cultural historic significance have been identified in the site, there would be no impact as a result of the proposed development.	-		S	S	U	CR	NL	Yes	• See Table 6.4	L	Heritage Impact Assessment

	access permit approval process). An internal site road network will also be required to provide access to each respective solar field and associated infrastructure. Internal access roads will be up to 12m in width. The main access road providing direct access to the project will be up to 8m wide and 6km long. Fencing - For health, safety and security reasons, the facility will be required to be fenced off from the surrounding farms. The project will have permanent security on site for 24hrs per day, 7 days a week.													(Appendix D5)
			Paleontological Heritage	• Loss of fossil heritage • Destroy or permanently seal-in fossils at or below the surface that are then no longer available for scientific study		-	S	P	U	BR	SL	Yes	• See Table 6.4	L	Paleontological Impact Assessment (Appendix D6)
			Health & Safety	• The proposed development will not result in any health and safety impacts during the operational phase.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-	N/A	N/A
			Positive social impacts	• Direct and indirect employment and skills development opportunities • Development of non-polluting, renewable energy infrastructure • Contribution to LED and social upliftment • Potential impacts on tourism • Increased household earnings	+		L-R/N	L	Pr/D	BR/PR/CR	NL / ML	Yes	• See Table 6.5	H-L	Social Impact Assessment (Appendix D7)
			Negative social impacts	• Potential impacts on tourism • Impacts associated with the loss of agricultural land. • Visual and sense of place impacts		-	S/ L	L	Pr	PR/ R	NI/ SL	Yes	• See Table 6.5	L	Social Impact Assessment (Appendix D7)
			Noise levels	• The proposed development will not result in any noise pollution during the operational phase.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Electricity supply	• Generation of additional electricity. • The power line will transport generated electricity into the grid.	+		I	L	D	I	N/A	Yes	-	N/A	-
			Electrical infrastructure	• Additional electrical infrastructure. The proposed solar facility will add to the existing electrical infrastructure and aid to lessen the reliance of electricity generation from coal-fired power stations.	+		I	L	D	I	N/A	Yes	-	N/A	-

DECOMMISSIONING PHASE															
-	Dismantlement of infrastructure During the decommissioning phase the Solar PV Energy facility and its associated infrastructure will be dismantled. Rehabilitation of biophysical environment The biophysical environment will be rehabilitated.	BIOPHYSICAL ENVIRONMENT	Fauna & Flora	• Direct habitat destruction • Habitat fragmentation • Increased soil erosion and sedimentation • Soil and water pollution • Air pollution • Spread and establishment of alien invasive species • Negative effect of human activities on fauna and road mortalities		-	S/L	M/L	D/Pr/Po	PR/CR	ML	Yes	• See Table 6.6	L	Terrestrial Biodiversity Impact Assessment (Appendix D1)
			Avifaunal	• Long-term or permanent degradation and modification of the receiving environment resulting to in the loss of important avian habitats. • Displacement of resident avifauna through increased disturbance.		-	S	L / M	Pr	BR/PR	ML / SL	Yes	• See Table 6.6	L	Avifaunal Impact Assessment (Appendix D2)
			Air quality	• Air pollution due to the increase of traffic of construction vehicles	-		S	S	D	CR	NL	Yes	• Regular maintenance of equipment to ensure reduced exhaust emissions.	L	-
			Existing services infrastructure	• Generation of waste that needs to be accommodated at a licensed landfill site • Generation of sewage that needs to be accommodated by the municipal sewerage system and the local sewage plant • Increase in construction vehicles	-		L	S	D	I	NL	Yes	-	L	Confirmation from the Local Municipality is required to confrim services availability
			Groundwater	• Pollution due to construction vehicles	-		S	S	Pr	CR	ML	Yes	• All vehicles should be inspected for oil and fuel leaks on a regular basis. • Vehicle maintenance yards on site should make provision for drip trays that will be used to capture any spills. Drip trays should be emptied into a holding tank and returned to the supplier.	L	-
			Visual landscape	• Visual impact of activities on sensitive visual receptors in close proximity to the proposed Naos Solar PV Project One.		-	L	S	D	PR	ML	Yes	• See Table 6.4	L	Visual Impact Assessment (Appendix D3)

				• The decommissioning phase of the project will result in the same visual impacts experienced during the construction phase of the project. However, in the case of Naos Solar PV Project One it is anticipated that the proposed facility will be refurbished and upgraded to prolong its life. No decommissioning of the facility is proposed.											
			Traffic volumes	• Road network will be affected • Increase in traffic influencing traffic congestion and road safety	-		L	S	D	CR	NL	Yes	• All decommissioning vehicles must be roadworthy and drivers must have the relevant licenses for the type of vehicles they are operating. • All vehicle drivers need to strictly adhere to the rules of the road.	L	-
			Health & Safety	• Air/dust pollution. • Road safety. • Increased crime levels. The presence of construction workers on the site may increase security risks associated with an increase in crime levels as a result of influx of people in the rural area.	-		L	S	Pr	PR	ML	Yes	• Demarcated routes to be established for construction vehicles to ensure the safety of communities, especially in terms of road safety and communities to be informed of these demarcated routes. • Where dust is generated by trucks passing on gravel roads, dust mitigation must be enforced. • Any infrastructure that would not be decommissioned must be appropriately locked and/or fenced off to ensure that it does not pose any danger to the community. • Components that are dismantled must be recycled / reduced as far as possible.	L	-
			Noise levels	• The generation of noise as a result of construction vehicles, the use of machinery and people working on the site	-		L	S	D	CR	NL	Yes	• The decommissioning phase must aim to adhere to the relevant noise regulations and limit noise within standard working hours in order to reduce disturbance of dwellings in close proximity to the development.	L	-

			Tourism industry	• The Wawielpark Holiday Resort is located ~1.7km west of the site. The Clementia Function and Conference Venue is located ~900m northwest of the site. The Seekoeigat Camping ground is located directly to the east of the site. There may be a nuisance impact and safety and security impact for these facilities.		-	L	S	D	CR	ML	Yes	• See Table 6.4	L	-

Nature of the impact:	(N/A) No impact	(+) Positive Impact	(-) Negative Impact	
Geographical extent:	(S) Site;	(L) Local/District;	(P) Province/Region;	(I) International and National
Probability:	(U) Unlikely;	(Po) Possible;	(Pr) Probable;	(D) Definite
Duration:	(S) Short Term;	(M) Medium Term;	(L) Long Term;	(P) Permanent
Intensity / Magnitude:	(L) Low;	(M) Medium;	(H) High;	(VH) Very High
Reversibility:	(CR) Completely Reversible;	(PR) Partly Reversible;	(BR) Barely Reversible;	-
Irreplaceable loss of resources:	(IR) Irreversible	(NL) No Loss;	(ML) Marginal Loss;	(SL) Significant Loss;	(CL) Complete Loss
Level of residual risk:	(L) Low;	(M) Medium;	(H) High;	(VH) Very High	-

The recommended mitigation measures are included in the Environmental Management Programme for the project. The EMPr for the Solar Power Plant is included in Appendix F1. The EMPr for the power line is included in Appendix F2 and the EMPr for the substation is included in Appendix F3. An Alien Invasive Plant Species Management and Rehabilitation Plan is included as Appendix F4.

An Environmental Awareness and Fire Management Plan is included in Appendix C of the EMPr in Appendix F1.

6.2 KEY ISSUES IDENTIFIED

From the above it is evident that mitigation measures should be available for potential impacts associated with the proposed activity and development phases. The scoping methodology identified the following key issues which were addressed in more detail in the BA report.

6.2.1 Impacts during the construction phase

During the construction phase the following activities will have various potential impacts on the biophysical and socio-economic environment:

- Activity 11(i) (GNR 327): *"The development of facilities or infrastructure for the transmission and distribution of electricity outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts."*
- Activity 12(ii)(a)(b) (GNR 327): *"The development of (ii) infrastructure or structures with a physical footprint of 100 square meters or more where such development occurs (a) within a watercourse or (b) within 32 meters of a watercourse, measured from the edge of a watercourse.*
- Activity 14 (GNR 327): *"The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres."*
- Activity 19 (GNR 327): *"The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic meters from a watercourse."*
- Activity 24 (ii) (GN.R 327): *"The development of a road (ii) with reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 meters"*
- Activity 28 (ii) (GN.R 327): *"Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 1998 and where such development (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare."*
- Activity 56 (ii) (GN.R 327): *"The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre (ii) where no reserve exists, where the existing road is wider than 8 metres…"*
- Activity 1 (GN.R 325): *"The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more."*
- Activity 15 (GN.R 325): *"The clearance of an area of 20 hectares or more of indigenous vegetation."*
- Activity 4 (b)(i)(bb)(ee)(gg) (GN.R 324): *"The development of a road wider than 4 metres with a reserve less than 13,5 metres (b) in the Free State, (i) outside urban*

areas and within (bb) National Protected Area Expansion Strategy, (ee) critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans and (gg) areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding disturbed areas."

- Activity 10 (b)(i)(bb)(ee)(gg)(hh) (GN.R 324): *"The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres (b) in the Free State (i) outside urban areas and within (bb) National Protected Area Expansion Strategy, (ee) Critical Biodiversity Areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans*, within *(gg) areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding disturbed areas and (hh) Areas within a watercourse or wetland, or within 100 metres from the edge of a watercourse or wetland."*

- Activity 12 (b)(i)(ii)(iv) (GN.R 324): *"The clearance of an area of 300 square metres or more of indigenous vegetation (b) in the Free State (i) within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004, (ii) within critical biodiversity areas identified in bioregional plans and (iv) areas within a watercourse or wetland; or within 100 metres from the edge of watercourse or wetland."*

- Activity 14(ii)(a)(c)(b)(i)(bb)(ff)(hh) (GN.R 324): *"The development of (ii) infrastructure or structures with a physical footprint of 10 square metres or more where such development occurs (a) within a watercourse; or (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; in the (b) Free State Province, (i) outside urban areas, within (bb) National Protected Area Expansion Strategy, (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans and (hh) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve."*

- Activity 18 (b)(i)(bb)(ee)(gg)(hh) (GN.R 324): *"The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre (b) in the Free State (i) outside urban areas, within (bb) National Protected Area Expansion Strategy, (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans, (gg) areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding*

disturbed areas and (hh) Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland."

During the construction phase minor negative impacts are foreseen over the short term. The latter refers to a period of months. Table 6.4 summarises the potentially most significant impacts and the mitigation measures that are proposed during the construction phase.

Table 6.4: Impacts and the mitigation measures during the construction phase

SPECIALIST STUDY	IMPACT	PRE-MITIGATION RATING	POST MITIGATION RATING	SUMMARY OF MITIGATION MEASURES
Terrestrial Biodiversity Impact Assessment (Appendix D1)	Direct habitat destruction	Negative Medium (45)	Negative Low (26)	• Peripheral impacts around the development footprint, on the surrounding vegetation of the area, should be avoided, while the rehabilitation of the site should be prioritised after construction has been completed and again after the decommissioning phase. Indigenous grass species that are present in this area should be sown. • During construction, sensitive habitats outside the development footprint must be avoided by construction vehicles and equipment, wherever possible, to reduce potential impacts. Only necessary damage must be caused and, for example, unnecessary driving around in the veld or bulldozing natural habitat must not take place. • All development activities must be restricted to specific recommended areas. The Environmental Control Officer (ECO) must control these areas. Storage of equipment, fuel and other materials must be limited to demarcated areas. Layouts must be adapted to fit natural patterns rather than imposing rigid geometries. The entire development footprint must be clearly demarcated prior to initial site clearance and prevent construction personnel from leaving the demarcated area. This would only be applicable to the construction phase of the proposed development. • The Environmental Site Officer (ESO) must advise the construction team in all relevant matters to ensure minimum destruction and damage to the environment. The ECO must enforce any measures that he/she deem necessary. Regular environmental training must be provided to

				construction workers to ensure the protection of the habitat, fauna and flora and their sensitivity to conservation. • Where holes for poles pose a risk to animal safety, they must be adequately cordoned off to prevent animals falling in and getting trapped and/or injured. This could be prevented by the constant excavating and backfilling during planting of the poles along the lines. • Poisons for the control of problem animals must be avoided since the wrong use thereof can have disastrous consequences for birds of prey. The use of poisons for the control of rats, mice or other vermin must only be used after approval from an ecologist. • Limit pesticide use to non-persistent, immobile pesticides and apply in accordance with label and application permit directions and stipulations for terrestrial and aquatic applications. • Monitoring must be implemented during the construction and decommissioning phases to ensure that minimal impact is caused to the fauna and flora of the area. • After the decommissioning phase the area must be rehabilitated.
	Habitat fragmentation	Negative Low (26)	Negative Low (10)	• Use existing facilities (e.g., impacted areas) to the extent possible to minimise the amount of new disturbance. • Disturbance in the wetlands must be minimised. • Construction activities must remain within defined construction areas. No construction / disturbance will occur outside these areas. • After decommissioning, infrastructure must be removed and disposed of in a responsible manner and the site has to be rehabilitated with indigenous species.

	Increased soil erosion and sedimentation	Negative Medium (30)	Negative Low (6)	• The project should be divided into as many phases as and where possible, to ensure that the exposed areas prone to erosion are minimal at any specific time. • Minimize the amount of land disturbance and develop and implement stringent erosion and dust control practices. • Protect sloping areas and drainage channel banks that are susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and Work Areas. • Repair all erosion damage as soon as possible to allow for sufficient rehabilitation growth. • Gravel roads to the construction sites must be well drained to limit soil erosion. • Control the flow of runoff to move the water safely off the site without destructive gully formation. • Protect all areas susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and Work Areas.
	Soil and water pollution	Negative Low (28)	Negative Low (6)	• Any excess or waste material or chemicals must be removed from the site and discarded in an environmentally friendly way. The ECO must enforce this rule rigorously. • Hazardous chemicals to be stored on an impervious surface protected from rainfall and storm water run-off. • Spill kits must be on-hand to deal with spills immediately. • All vehicles must be inspected for oil and fuel leaks on a regular basis. Vehicle maintenance yards on site must make provision for drip trays that

				will be used to capture any spills. Drip trays must be emptied into a holding tank and returned to the supplier.
	Air pollution	Negative Low (26)	Negative Low (9)	• A speed limit must be enforced on dirt roads (preferably 30-40km/h). • Implement standard dust control measures, including periodic spraying (frequency will depend on many factors including weather conditions, soil composition and traffic intensity and must thus be adapted on an on-going basis) of construction areas and access roads, and ensure that these are continuously monitored to ensure effective implementation.
	Spread and establishment of alien invasive species	Negative Medium (30)	Negative Low (6)	• Control involves killing the plants present, killing the seedlings which emerge, and establishing and managing an alternative plant cover to limit re-growth and re-invasion. Weeds and invader plants will be controlled in the manner prescribed for that category by the CARA (Conservation of Agricultural Resources Act) or in terms of Working for Water guidelines. The control of these species must begin prior to the construction phase considering that small populations of these species was observed during the field surveys, which can be coordinated between the ESO and the ECO. • Institute strict control over materials brought onto site, which must be inspected for seeds of noxious plants and steps taken to eradicate these before transport to the site. Routinely fumigate or spray all materials with appropriate low-residual herbicides prior to transport to or in a quarantine area on site. The contractor is responsible for the control of weeds and invader plants within the construction site for the duration of the construction phase. Existing Eucalyptus camaldulensis trees must be eradicated.

				• Rehabilitate disturbed areas outside the project development footprint as quickly as possible to reduce the area where invasive species would be at a strong advantage and most easily able to establish. • Implement the monitoring programme to detect alien invasive species early, before they become established and, in the case of weeds, before the release of seeds. Once detected, an eradication/control programme must be implemented to ensure that the species' do not spread to surrounding natural ecosystems.
	Negative effect of human activities on fauna and road mortalities	Negative Low (26)	Negative Low (8)	• No staff must be accommodated on the site. If practical, construction workers must stay in one of the nearby towns/villages and transported daily to the site. • The ECO must regularly inspect the site, including storage facilities and compounds and eradicate any invasive or exotic plants and animals. • Educate construction workers regarding risks and correct disposal of cigarettes. • More fauna is normally killed the faster vehicles travel. A speed limit must be enforced (preferably 40 km/hour). It can be considered to install speed bumps in sections where the speed limit tends to be disobeyed. (Speed limits will also lessen the probability of road accidents and their negative consequences). • Travelling at night must be avoided or limited as much as possible.
Wetland Impact Assessment (Appendix D8)	Compaction, soil erosion and sedimentation	Negative Low	Negative Low	• Compaction of soils must be limited and / or avoided as far as possible. Compaction will reduce water infiltration and will result in increased runoff and erosion. Where any disturbance of the soil takes place (have taken place in the past), these areas must be stabilised and any alien plants which establish must be cleared and follow-up undertaken for the duration of the

(Ratings are as per the GNR 509 Risk Assessment Matrix)				construction and decommissioning phases. It is to be undertaken by the Internal Environmental Officer or the Environmental Control Officer. Where compaction becomes apparent, remedial measures must be taken (e.g., "ripping" the affected area). • Reseed any areas where earthworks have taken place with indigenous grasses to prevent further erosion. • Erosion control mechanisms must be established as soon as possible. • A stormwater plan must be developed with the aid of an engineer to ensure that water runoff is diverted off the site without pooling and stagnation or causing erosion. Financial provision for closure will include the estimated costs for erosion control post-construction and post-decommissioning. • Where the power line connection crosses the wetlands, disturbance must be kept to a minimum. Care must be taken not to change the hydrology of the wetlands and rehabilitation of vegetation might be required. • If compaction occurs, rectification can be done by application and mixing of manure, vegetation mulch or any other organic material into the area. Use of well cured manure is preferable as it will not be associated with the nitrogen negative period associated with organic material that is not composted. • Vehicle traffic must not be allowed on the rehabilitated areas, except on allocated roads, due to adverse impacts of dispersive/compaction characteristics of soils and its implications on the long term. • Appropriate design and mitigation measures must be developed and implemented to minimise impacts on the natural flow regime of the watercourse i.e., through placement of structures/supports and to minimise turbulent flow in the watercourse.

				• The indiscriminate use of machinery within the wetland area will lead to compaction of soils and destruction of vegetation and must therefore be strictly controlled. • Perform scheduled maintenance to be prepared for storm events. Ensure that culverts have their maximum capacity, ditches are cleaned, and that channels are free of debris and brush than can block structures.
	Disturbance of watercourse habitat and fringe vegetation	Negative Low	Negative Low	• As far as possible, disturbance should be kept outside of the wetlands and their buffer zones. • Existing access roads should be used where possible.
	Soil and water pollution	Negative Low	Negative Low	• Ensure that all hazardous storage containers and storage areas comply with the relevant SABS standards to prevent leakage. Regularly inspect all vehicles for leaks. Re-fuelling must take place on a sealed surface area to prevent ingress of hydrocarbons into topsoil. • No dumping of waste must take place within the wetlands or their buffer zones. If any spills occur, they must be cleaned up immediately. • Contain all dirty water in the dirty water system and contain all dirty stormwater up to a 1:50 year flood line as a minimum. Ensure that all activities impacting on groundwater resources of the subject property are managed according to the relevant DWS Licensing regulations and groundwater monitoring and management requirements. • Appropriate sanitary facilities must be provided for the duration of the proposed development and all waste removed to an appropriate waste facility. • Excess waste or chemicals must be removed from site and discarded in an environmentally friendly way. The Environmental Control Officer (ECO) must enforce this rule rigorously.

				• Hazardous chemicals to be stored on an impervious surface protected from rainfall and stormwater run-off. • Spill kits must be on-hand to deal with spills immediately. • All vehicles must be inspected for oil and fuel leaks on a regular basis. Vehicle maintenance yards on site must make provision for drip trays to capture spills. Drip trays must be emptied into a holding tank and returned to the supplier. • Implement standard dust control measures, including periodic spraying (frequency will depend on many factors including weather conditions, soil composition and traffic intensity and must thus be adapted on an on-going basis) and chemical dust suppressants of construction areas and access roads, and ensure that these are continuously monitored to ensure effective implementation. • A speed limit (preferably 40 km/hour) must be enforced on dirt roads. • Limit pesticide use to non-persistent, immobile pesticides and apply in accordance with the label and application permit directions and stipulations for terrestrial and aquatic applications.
	Spread and establishment of alien invasive species	Negative Low	Negative Low	• Alien and invader vegetation must not be allowed to colonise the area. Control involves killing alien invasive plants present, seedlings and establishing an alternative plant cover to limit re-growth. The use of indigenous plants must be encouraged in the rehabilitated areas (stormwater canals). Control must begin prior to the construction phase considering that small populations of invader plant species occur around the project area. • Institute strict control over materials brought onto site, which must be inspected for seeds and steps taken to eradicate these before transport to

				the site. The contractor is responsible for the control of weeds and invader plants. • Rehabilitate disturbed areas outside the development footprint as quickly as possible. • Institute a monitoring programme during construction, undertaken by the IEO or the ECO, to detect alien invasive species early. Monitoring must be done periodically by the ECO. • Institute an eradication/control programme for early intervention if invasive species are detected. The use of indigenous plants must be encouraged in the rehabilitated areas.
Avifaunal Impact Assessment (Appendix D2)	Loss of priority avian species from important habitats	Negative Medium (42)	Negative Low (16)	• Minimise the construction footprint and preserve indigenous vegetation wherever possible. • All vegetation not required to be removed should be protected against damage. • Construct development in shortest timeframe. • Control pollution.
	Loss of resident avifauna through increased disturbance	Negative Medium (36)	Negative Low (16)	• Minimise the construction footprint and preserve indigenous vegetation wherever possible. • All vegetation note required to be removed should be protected against damage. • Construct development in shortest timeframe. • Control pollution.
	Long-term or permanent degradation and modification of the	Negative Medium (45)	Negative Low (20)	• Minimise the construction footprint and preserve indigenous vegetation wherever possible. • Construct development in shortest timeframe. • Control noise pollution.

	receiving environment resulting to in the loss of important avian habitats			• Use designated roads to access the site and power line route. • Rehabilitate the area with indigenous vegetation.
Soils and Agricultural Impact Assessment (Appendix D4)	Loss of land capability	Negative Medium (36) - Solar PV Negative Low (24) - Power Line	Negative Low (12) – Solar PV Negative Low (8) - Power Line	• Vegetate or cover all stockpiles after stripping/removing soils • Storage of potential contaminants should be undertaken in bunded areas • All contractors must have spill kits available and be trained in the correct use thereof. • All contractors and employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good "housekeeping". • No cleaning or servicing of vehicles, machines and equipment may be undertaken in water resources. • Have action plans on site, and training for contractors and employees in the event of spills, leaks and other impacts to the aquatic systems.
Heritage Impact Assessment (Appendix D5)	Loss or damage to sites, features or objects of cultural heritage significance As no sites, features or objects of cultural historic significance have been identified in the project area,	Negative Low (6)	Negative Low (6)	• The contractors and workers should be notified that archaeological sites might be exposed during the construction activities. • Should any heritage artefacts be exposed during excavation, work on the area where the artefacts were discovered, shall cease immediately and the Environmental Control Officer (ECO) shall be notified as soon as possible. • All discoveries shall be reported immediately to a heritage practitioner so that an investigation and evaluation of the finds can be made. Acting upon advice from these specialists, the ECO will advise the necessary actions to be taken.

	there would be no impact as a result of the proposed development.			• Under no circumstances shall any artefacts be removed, destroyed or interfered with by anyone on the site other than by the ECO under the instructions of a qualified heritage specialists as per the protocols required by NHRA. • Contractors and workers shall be advised of the penalties associated with the unlawful removal of cultural, historical, archaeological or palaeontological artefacts, as set out in the NHRA, Section 51(1). • A person or entity, e.g. the ECO, should be tasked to take responsibility for the maintenance of heritage sites. • In areas where the vegetation is threatening the heritage sites, e.g. growing trees pushing walls over, it should be removed, but only after permission for the methods proposed has been granted by the SAHRA. A heritage official should be part of the team executing these measures. • Should archaeological sites or graves be exposed during construction work, it must immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made. The appropriate steps to take are indicated in Section 9 of the report, as well as in the Management Plan: Burial Grounds and Graves, with reference to general heritage sites, in the Addendum, Section 13.5. Refer to the Heritage Impact Assessment (Appendix D5).
Palaeontological Impact Assessment (Appendix D6)	Destroy or permanently seal-in fossils at or below the surface that are then no longer	Negative Medium (48)	Negative Low (16)	• If fossil remains are discovered during any phase of construction, either on the surface or exposed by excavations the Chance Find Protocol (Section 13 of the Palaeontoloigcal Impact Assessment, Appendix D6) must be implemented by the ECO/site manager in charge of these developments. These discoveries ought to be protected (if possible, in situ) and the ECO/site manager must report to SAHRA (Contact details: SAHRA, 111

	available for scientific study			Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za) so that mitigation (recording and collection) can be carry out by a palaeontologist.
Visual Impact Assessment (Appendix D3)	Visual impact of construction activities of the solar facility	Negative Medium (45)	Negative Low (24)	Planning • Retain and maintain natural vegetation immediately adjacent to the development footprint. Construction • Ensure that vegetation is not unnecessarily removed during the construction phase. • Plan the placement of laydown areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e., in already disturbed areas) where possible. • Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads. • Ensure that rubble, litter, etc. are appropriately stored (if it can't be removed daily) and then disposed of regularly at a licenced waste site. • Reduce and control dust during construction by utilising dust suppression measures. • Limit construction activities between 07:00 and 18:00, where possible, in order to reduce the impacts of construction lighting. • Rehabilitate all disturbed areas immediately after the completion of construction work and maintain good housekeeping.
	Construction impacts of the grid connection corridor	Negative Low (28)	Negative Low (10)	Planning

	alternatives 1A, 1B, 1C, 2 and 3.			• Retain and maintain natural vegetation immediately adjacent to the development footprint. Construction • Ensure that vegetation is not unnecessarily removed during the construction phase. • Plan the placement of laydown areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e., in already disturbed areas) where possible. • Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads. • Ensure that rubble, litter, etc. are appropriately stored (if it can't be removed daily) and then disposed of regularly at a licenced waste site. • Reduce and control dust during construction by utilising dust suppression measures. • Limit construction activities between 07:00 and 18:00, where possible, in order to reduce the impacts of construction lighting. • Rehabilitate all disturbed areas immediately after the completion of construction work and maintain good housekeeping.
	Construction impacts of the grid connection corridor alternative 4.	Negative Low (28)	Negative Low (10)	
Social Impact Assessment (Appendix D7)	Creation of direct and indirect employment and skills development opportunities.	Positive Low (22)	Positive Medium (36)	Enhancement: • A local employment policy should be adopted to maximise opportunities made available to the local labour force. • Labour should be sourced from the local labour pool, and only if the necessary skills are unavailable should labour be sourced from (in order of preference) the greater Moqhaka LM, Fezile Dabi DM, Free State Province, South Africa, or elsewhere.

				• Where feasible, training and skills development programmes should be initiated prior to the commencement of the construction phase. • As with the labour force, suppliers should also as far as possible be sourced locally. • As far as possible local contractors that are compliant with Broad-Based Black Economic Empowerment (B-BBEE) criteria should be used. • The recruitment selection process should seek to promote gender equality and the employment of women wherever possible. • The recruitment process should ensure that all contracts should require compliance with relevant human rights legislation and ensure human rights are maintained.
	Economic Multiplier effect	Positive Low (22)	Positive Medium (39)	Enhancement: • It is recommended that a local procurement policy is adopted to maximise the benefit to the local economy. • A database of local companies, specifically Historically Disadvantaged Individuals (HDIs) which qualify as potential service providers (e.g., construction companies, security companies, catering companies, waste collection companies, transportation companies etc.) should be created and companies listed thereon should be invited to bid for project-related work where applicable. • Local procurement is encouraged along with engagement with local authorities and business organisations to investigate the possibility of procurement of construction materials, goods and products from local suppliers where feasible.
	Improvements to shared infrastructure	Positive Low (11)	Positive Low (26)	Enhancement:

				• The project would contribute to an upgrade in the shared infrastructure of the LM as well as in the maintenance of this infrastructure. • The LM would be encouraged to participate in this maintenance and upgrade where it would be feasible for them to be involved. • A database of local companies, specifically Historically Disadvantaged Individuals (HDIs) which qualify as potential service providers (e.g., construction companies, security companies, catering companies, waste collection companies, transportation companies etc.) should be created (or sourced from the local Municipality, where available) and companies listed thereon should be invited to bid for project-related work where applicable and this would include the maintenance of this shared infrastructure.
	Potential loss of productive farmland	Negative Medium (39)	Negative Low (20)	• The proposed site needs to be fenced off prior to the construction phase and all construction related activities should be confined in this fenced off area. • Livestock grazing on the proposed site need to be relocated. • All affected areas outside of the development footprint, which are disturbed during the construction phase, need to be rehabilitated prior to the operational phase and should be continuously monitored. • Implement, manage and monitor a grievance mechanism for the recording and management of social issues and complaints.
	In-migration of people (non-local workforce and jobseekers).	Negative Medium (38)	Negative Low (17)	• Develop and implement a local procurement policy which prioritises “locals first” to prevent the movement of people into the area in search of work. • Engage with local community representatives prior to construction to facilitate the adoption of the locals first procurement policy.

				• Provide transportation for workers (from closest towns and surrounds) to ensure workers can easily access their place of employment and do not need to move closer to the project site. • As far as possible, working hours should be kept between daylight hours during the construction phase, and / or as any deviation that is approved by the relevant authorities. • Compile and implement a grievance mechanism. • Appoint a Community Liaison Officer (CLO) to assist with the procurement of local labour. • Prevent the recruitment of workers at the project site. • Implement, manage and monitor a grievance mechanism for the recording and management of social issues and complaints. • Establish clear rules and regulations for access to the proposed site. • Appoint a security company and implement appropriate security procedures to ensure that workers do not remain onsite after working hours. • Inform local community organisations and policing forums of construction times and the duration of the construction phase. • Establish procedures for the control and removal of loiterers from the construction site.
	Safety and security impacts	Negative Medium (36)	Negative Low (18)	• As far as possible, working hours should be kept within daylight hours during the construction phase, and / or as any deviation that is approved by the relevant authorities. • Provide transportation for workers to prevent loitering within or near the project site outside of working hours.

				• The perimeter of the construction site should be appropriately secured to prevent any unauthorised access to the site. The fencing of the site should be maintained throughout the construction period. • The appointed EPC Contractor must appoint a security company to ensure appropriate security procedures and measures are implemented. • Access in and out of the construction site should be strictly controlled by a security company appointed to the project. • A CLO should be appointed as a grievance mechanism. A method of communication should be implemented whereby procedures to lodge complaints are set out for the local community to express any complaints or grievances with the construction process. • The EPC Contractor should implement a stakeholder management plan to address neighbouring farmer concerns regarding safety and security. • The project proposed must prepare and implement a Fire Management Plan; this must be done in conjunction with surrounding landowners. • The EPC Contractor must prepare a Method Statement which deals with fire prevention and management.
	Impacts on daily living and movement patterns	Negative Medium (36)	Negative Low (20)	• All vehicles must be road worthy, and drivers must be qualified, obey traffic rules, follow speed limits and be made aware of the potential road safety issues. • Heavy vehicles should be inspected regularly to ensure their road worthiness. • Provision of adequate and strategically placed traffic warning signs, that have to be maintained for the duration of the construction phase, and control measures along the Vermaasdrift road and S643 road and gravel road off the R59 and R501 roads to warn road users of the construction

				activities taking place for the duration of the construction phase. Warning signs must be always visible, especially at night. • Implement penalties for reckless driving to enforce compliance to traffic rules. • Avoid heavy vehicle activity during "peak" hours (when children are taken to school, or people are driving to work). • The developer and EPC Contractor must ensure that all fencing along access roads is maintained in the present condition or repaired if disturbed due to construction activities. • The developer and EPC Contractor must ensure that the roads utilised for construction activities are either maintained in the present condition or upgraded if disturbed due to construction activities. • The EPC Contractor must ensure that damage / wear and tear caused by construction related traffic to the access roads is repaired before the completion of the construction phase. • A method of communication must be implemented whereby procedures to lodge complaints are set out for the local community to express any complaints or grievances with the construction process.
	Nuisance impacts (noise and dust)	Negative Medium (33)	Negative Low (20)	• The movement of heavy vehicles associated with the construction phase should be timed to avoid weekends, public holidays, and holiday periods where feasible. • Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers. • Ensure all vehicles are road worthy, drivers are qualified and are made aware of the potential noise and dust issues.

				• A CLO should be appointed, and a grievance mechanism implemented.
	Increased risk of potential veld fires	Negative Medium (36)	Negative Low (18)	• A firebreak should be implemented before the construction phase. The firebreak should be controlled and implemented around the perimeters of the project site. • Adequate fire-fighting equipment should be provided and readily available on site and all staff should be trained in firefighting and how to use the fire-fighting equipment. • No staff (except security) should be accommodated overnight on site and the contractor should ensure that no open fires are allowed on site. The use of cooking or heating implements should only be used in designated areas. • Contractors need to ensure that any construction related activities that might pose potential fire risks, are done in the designated areas where it is also managed properly. • Precautionary measures need to be taken during high wind conditions or during the winter months when the fields are dry. • The contractor should enter an agreement with the local farmers before the construction phase that any damages or losses during the construction phase related to the risk of fire and that are created by staff during the construction phase, are borne by the contractor.
	Visual and sense of place impacts	Negative Low (12)	Negative Low (9)	• Implement mitigation measures identified in the Visual Impact Assessment (VIA) prepared for the project. • As far as possible, limit noise generating activities to normal daylight working hours and avoid weekends and public holidays.

				• The movement of heavy vehicles associated with the construction phase should be timed to avoid weekends, public holidays, and holiday periods where feasible. • Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers. • All vehicles must be road-worthy, and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits. • Communication, complaints, and grievance channels must be implemented and contact details of the CLO must be provided to the local community in the study area.

6.2.2 Impacts during the operational phase

During the operational phase the study area will serve as a solar energy. The potential impacts will take place over a period of 20 – 30 years. During the operational phase the following activities will have various potential impacts on the biophysical and socio-economic environment:

- Activity 11(i) (GNR 327): *"The development of facilities or infrastructure for the transmission and distribution of electricity outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts."*
- Activity 14 (GNR 327): *"The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres."*
- Activity 28 (ii) (GN.R 327): *"Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 1998 and where such development (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare."*
- Activity 1 (GN.R 325): *"The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more."*
- Activity 10 (b)(i)(bb)(ee)(gg)(hh) (GN.R 324): *"The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres (b) in the Free State (i) outside urban areas and within (bb) National Protected Area Expansion Strategy, (ee) Critical Biodiversity Areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans, within (gg) areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding disturbed areas and (hh) Areas within a watercourse or wetland, or within 100 metres from the edge of a watercourse or wetland."*

Table 6.5 summarised the negative impacts are generally associated with the Naos Solar PV Project One (including other associated infrastructure and grid connection infrastructure), which include impacts on the fauna and flora, soils, avifauna, surface water, the pressure on existing services infrastructure, and visual impacts. The provision of sustainable services delivery also needs to be confirmed. The operational phase will have a direct positive impact through the provision of employment opportunities for its duration, and the generation of income to the local community

Table 6.5: Impacts and the mitigation measures during the operational phase

SPECIALIST STUDY	IMPACT	PRE-MITIGATION RATING	POST MITIGATION RATING	SUMMARY OF MITIGATION MEASURES
Terrestrial Biodiversity Impact Assessment (Appendix D1)	Direct habitat destruction	Negative Medium (45)	Negative Low (26)	• Peripheral impacts around the development footprint, on the surrounding vegetation of the area, should be avoided, while the rehabilitation of the site should be prioritised after construction has been completed and again after the decommissioning phase. Indigenous grass species that are present in this area should be sown. • Storage of equipment, fuel and other materials must be limited to demarcated areas. • Poisons for the control of problem animals must be avoided since the wrong use thereof can have disastrous consequences for birds of prey. The use of poisons for the control of rats, mice or other vermin must only be used after approval from an ecologist. • Limit pesticide use to non-persistent, immobile pesticides and apply in accordance with label and application permit directions and stipulations for terrestrial and aquatic applications.
	Habitat fragmentation	Negative Low (24)	Negative Low (10)	• Disturbance in the wetlands must be minimised. • Maintenance activities must remain within defined areas. No disturbance must occur outside these areas.
	Increased soil erosion and sedimentation	Negative Low (26)	Negative Low (6)	• Cover disturbed soils as completely as possible, using vegetation or other materials, during maintenance activities.

				• Minimize the amount of land disturbance and implement stringent erosion and dust control practices. • Protect sloping areas and drainage channel banks that are susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the site. • Repair all erosion damage as soon as possible to allow for sufficient rehabilitation growth. • Gravel roads associated with the development must be well drained to limit soil erosion. • Control the flow of runoff to move the water safely off the site without destructive gully formation. • Protect all areas susceptible to erosion and ensure that there is no undue soil erosion resultant from maintenance and operation activities within and adjacent to site.
	Soil and water pollution	Negative Low (26)	Negative Low (6)	• Any excess or waste material or chemicals must be removed from the site and discarded in an environmentally friendly way. • Hazardous chemicals to be stored on an impervious surface protected from rainfall and storm water run-off. • Spill kits must be on-hand to deal with spills immediately. • All vehicles must be inspected for oil and fuel leaks on a regular basis. Vehicle maintenance yards on site must make provision for drip trays that will be used to capture any spills. Drip trays must be emptied into a holding tank and returned to the supplier.

	Air pollution	Negative Low (22)	Negative Low (8)	• A speed limit must be enforced on dirt roads (preferably 30-40km/h). • Implement standard dust control measures, including periodic spraying (frequency will depend on many factors including weather conditions, soil composition and traffic intensity and must thus be adapted on an on-going basis) of access roads, and ensure that these are continuously monitored to ensure effective implementation.
	Spread and establishment of alien invasive species	Negative Low (28)	Negative Low (6)	• Control involves killing the plants present, killing the seedlings which emerge, and establishing and managing an alternative plant cover to limit re-growth and re-invasion. Weeds and invader plants will be controlled in the manner prescribed for that category by the CARA (Conservation of Agricultural Resources Act) or in terms of Working for Water guidelines. • Institute a monitoring programme to detect alien invasive species early, before they become established and, in the case of weeds, before the release of seeds. Once detected, an eradication/control programme must be implemented to ensure that the species' do not spread to surrounding natural ecosystems.
	Negative effect of human activities and road mortalities	Negative Low (12)	Negative Low (7)	• regularly inspect the site, including storage facilities and compounds and eradicate any invasive or exotic plants and animals. • Maintain proper firebreaks around the entire development footprint. • More fauna is normally killed the faster vehicles travel. A speed limit must be enforced (preferably 40 km/hour). It can

				be considered to install speed bumps in sections where the speed limit tends to be disobeyed. (Speed limits will also lessen the probability of road accidents and their negative consequences). • Travelling at night must be avoided or limited as much as possible.
Wetland Impact Assessment (Appendix D8) (Ratings are as per the GNR 509 Risk Assessment Matrix)	Compaction, soil erosion and sedimentation	Negative Low	Negative Low	• Compaction of soils must be limited and / or avoided as far as possible. Compaction will reduce water infiltration and will result in increased runoff and erosion. Where any disturbance of the soil takes place (have taken place in the past), these areas must be stabilised and any alien plants which establish must be cleared and follow-up undertaken for the duration of the construction and decommissioning phases. It is to be undertaken by the Internal Environmental Officer or the Environmental Control Officer. Where compaction becomes apparent, remedial measures must be taken (e.g., "ripping" the affected area). • Reseed any areas where earthworks have taken place with indigenous grasses to prevent further erosion. • Erosion control mechanisms must be established as soon as possible. • A stormwater plan must be implemented to ensure that water runoff is diverted off the site without pooling and stagnation or causing erosion. Financial provision for closure will include the estimated costs for erosion control post-construction and post-decommissioning. • Where the power line connection crosses the wetlands, disturbance must be kept to a minimum. Care must be taken

				not to change the hydrology of the wetlands and rehabilitation of vegetation might be required. • If compaction occurs, rectification can be done by application and mixing of manure, vegetation mulch or any other organic material into the area. Use of well cured manure is preferable as it will not be associated with the nitrogen negative period associated with organic material that is not composted. • Vehicle traffic must not be allowed on the rehabilitated areas, except on allocated roads, due to adverse impacts of dispersive/compaction characteristics of soils and its implications on the long term. • The indiscriminate use of machinery within the wetland area will lead to compaction of soils and destruction of vegetation and must therefore be strictly controlled. • Perform scheduled maintenance to be prepared for storm events. Ensure that culverts have their maximum capacity, ditches are cleaned, and that channels are free of debris and brush than can block structures.
	Disturbance of watercourse habitat and fringe vegetation	Negative Low	Negative Low	• As far as possible, disturbance should be kept outside of the wetlands and their buffer zones. • Existing access roads should be used where possible.
	Soil and water pollution	Negative Low	Negative Low	• Ensure that all hazardous storage containers and storage areas comply with the relevant SABS standards to prevent leakage. Regularly inspect all vehicles for leaks. Re-fuelling must take place on a sealed surface area to prevent ingress of hydrocarbons into topsoil.

				• No dumping of waste must take place within the wetlands or their buffer zones (32m). If any spills occur, they must be cleaned up immediately. • Contain all dirty water in the dirty water system and contain all dirty stormwater up to a 1:50 year flood line as a minimum. Ensure that all activities impacting on groundwater resources of the subject property are managed according to the relevant DWS Licensing regulations and groundwater monitoring and management requirements. • Appropriate sanitary facilities must be provided for the duration of the proposed development and all waste removed to an appropriate waste facility. • Excess waste or chemicals must be removed from site and discarded in an environmentally friendly way. • Hazardous chemicals to be stored on an impervious surface protected from rainfall and stormwater run-off. • Spill kits must be on-hand to deal with spills immediately. • All vehicles must be inspected for oil and fuel leaks on a regular basis. Vehicle maintenance yards on site must make provision for drip trays to capture spills. Drip trays must be emptied into a holding tank and returned to the supplier. • Implement standard dust control measures, including periodic spraying (frequency will depend on many factors including weather conditions, soil composition and traffic intensity and must thus be adapted on an on-going basis) and chemical dust suppressants of access roads, and ensure that

				these are continuously monitored to ensure effective implementation. • A speed limit (preferably 40 km/hour) must be enforced on dirt roads. • Limit pesticide use to non-persistent, immobile pesticides and apply in accordance with the label and application permit directions and stipulations for terrestrial and aquatic applications.
	Spread and establishment of alien invasive species	Negative Low	Negative Low	• Alien and invader vegetation must not be allowed to colonise the area. Control involves killing alien invasive plants present, seedlings and establishing an alternative plant cover to limit re-growth. The use of indigenous plants must be encouraged in the rehabilitated areas (stormwater canals). • Institute strict control over materials brought onto site, which must be inspected for seeds and steps taken to eradicate these before transport to the site. The contractor is responsible for the control of weeds and invader plants. • Rehabilitate disturbed areas outside the development footprint as quickly as possible, following maintenance activities and decommissioning. • Institute an eradication/control programme for early intervention if invasive species are detected. The use of indigenous plants must be encouraged in the rehabilitated areas.
Avifauna Impact Assessment	Long-term or permanent degradation and	Negative Medium (45)	Negative Low (20)	• Monitor and rehabilitate any degraded areas resulting from operational activities.

(Appendix D2)	modification of the receiving environment resulting to in the loss of important avian habitats			• Existing roads must be used where possible during the maintenance. • Roosting areas and nests (where present) must not be disturbed without consulting an avifaunal specialist.
	Loss of resident avifauna through increased disturbance	Negative Medium (36)	Negative Low (16)	• Monitor and rehabilitate any degraded areas resulting from operational activities. • Use indigenous species for revegetating cleared areas that are no longer required for development activities.
	Collisions with PV panels and electrocution risks leading to injury or loss of avian life which decreases avifauna species diversity	Negative Medium (36)	Negative Low (18)	• Ensure the boundary fence is equipped with anti-collission markers.
	Collisions with overhead lines and electrocution risks leading to injury or loss of avian life which decreases avian diversity	Negative Medium (36)	Negative Low (18)	• Ensure overhead lines are marked with bird flight diverters along collision risk areas. • Conduct quarterly fatality monitoring assessments.
Soils and Agricultural Impact Assessment (Appendix D4)	Loss of land capability	Negative Medium (24) -Solar PV Negative Low (15) - Power Line	Negative Low (8) – Solar PV Negative Low (8) - Power Line	• Continuously monitor erosion on site. • Monitor compaction on site.

Heritage Impact Assessment (Appendix D5)	Loss or damage to sites, features or objects of cultural heritage significance As no sites, features or objects of cultural historic significance have been identified in the project area, there would be no impact as a result of the proposed development.	Negative Low (6)	Negative Low (6)	• The contractors and workers should be notified that archaeological sites might be exposed during the construction activities. • Should any heritage artefacts be exposed during excavation, work on the area where the artefacts were discovered, shall cease immediately and the Environmental Control Officer (ECO) shall be notified as soon as possible. • All discoveries shall be reported immediately to a heritage practitioner so that an investigation and evaluation of the finds can be made. Acting upon advice from these specialists, the ECO will advise the necessary actions to be taken. • Under no circumstances shall any artefacts be removed, destroyed or interfered with by anyone on the site other than by the ECO under the instructions of a qualified heritage specialists as per the protocols required by NHRA. • Contractors and workers shall be advised of the penalties associated with the unlawful removal of cultural, historical, archaeological or palaeontological artefacts, as set out in the NHRA, Section 51(1). • A person or entity, e.g. the ECO, should be tasked to take responsibility for the maintenance of heritage sites. • In areas where the vegetation is threatening the heritage sites, e.g. growing trees pushing walls over, it should be removed, but only after permission for the methods proposed has been granted by the SAHRA. A heritage official should be part of the team executing these measures.

				• Should archaeological sites or graves be exposed during construction work, it must immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made. The appropriate steps to take are indicated in Section 9 of the report, as well as in the Management Plan: Burial Grounds and Graves, with reference to general heritage sites, in the Addendum, Section 13.5. Refer to the Heritage Impact Assessment (Appendix D5).
Visual Impact Assessment (Appendix D3)	Potential visual impacts on sensitive visual receptors located within a 1km radius from the solar facility.	Negative Medium (34)	Negative Low (28)	Planning • Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint. • Where insufficient natural vegetation exists next to the property, a 'screen' can be planted if the landowner requests additional mitigation. This can be done using endemic, fast growers that are water efficient. Operations • Maintain general appearance of the facility as a whole.
	Potential visual impacts on sensitive visual receptors located within a 1km radius from the grid connection corridor alternatives 1A, 1B, 1Cc, 2 and 3.\	Negative Medium (30)	Negative Low (28)	Planning • Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint. Operations • Maintain general appearance of the power line corridor. • Screening can be established near sensitive receptors, upon request, rather than to mitigate the impact at the source.
	Potential visual impacts on sensitive visual receptors	Negative Medium (30)	Negative Low (28)	

	located within a 1km radius from the grid connection corridor alternative 4.			
	Potential visual impacts on sensitive visual receptors between a 1km and 3km radius from the solar facility.	Negative Medium (32)	Negative Low (26)	Planning • Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint. • Where insufficient natural vegetation exists next to the property, a 'screen' can be planted if the landowner requests additional mitigation. This can be done using endemic, fast growers that are water efficient. Operations • Maintain general appearance of the facility as a whole.
	Potential visual impacts on sensitive visual receptors between a 1km and 3km radius from the 1A, 1B, 1C, 2 and 3.	Negative Medium (32)	Negative Low (26)	Planning • Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint. Operations • Maintain general appearance of the power line corridor. • Screening can be established near sensitive receptors, upon request, rather than to mitigate the impact at the source.
	Potential visual impacts on sensitive visual receptors between a 1km and 3km radius from the grid connection corridor alternative 4.	Negative Medium (32)	Negative Low (26)	
	Potential visual impacts on sensitive visual receptors between a 3km and 5km	Negative Medium (30)	Negative Low (13)	Planning • Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint.

	radius from the solar facility.			• Where insufficient natural vegetation exists next to the property, a 'screen' can be planted if the landowner requests additional mitigation. This can be done using endemic, fast growers that are water efficient. Operations • Maintain general appearance of the facility as a whole.
	Potential visual impacts on sensitive visual receptors between a 3km and 5km radius from the grid connection corridor alternatives 1A, 1B, 1C, 2 and 3.	Negative Low (15)	Negative Low (13)	Planning • Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint. Operations • Maintain general appearance of the power line corridor. • Screening can be established near sensitive receptors, upon request, rather than to mitigate the impact at the source.
	Potential visual impacts on sensitive visual receptors between a 3km and 5km radius from the grid connection corridor alternative 4.	Negative Low (15)	Negative Low (13)	
	Potential visual impacts on sensitive visual receptors located between a 5km and 10km radius from the solar facility.	Negative Low (28)	Negative Low (12)	Planning • Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint. • Where insufficient natural vegetation exists next to the property, a 'screen' can be planted if the landowner requests additional mitigation. This can be done using endemic, fast growers that are water efficient.

				Operations • Maintain general appearance of the facility as a whole.
	Potential visual impacts on sensitive visual receptors located between a 5km and 10km radius from the grid connection corridor alternatives 1A, 1B, 1C, 2 and 3.	Negative Low (12)	Negative Low (11)	Planning • Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint. Operations • Maintain general appearance of the power line corridor. • Screening can be established near sensitive receptors, upon request, rather than to mitigate the impact at the source.
	Potential visual impacts on sensitive visual receptors located between a 5km and 10km radius from the grid connection corridor alternative 4.	Negative Low (12)	Negative Low (11)	
	Lighting Impacts of the solar facility.	Negative Medium (39)	Negative Low (20)	Planning & Operation As far as practically possible: • Shield the source of light by physical barriers (walls, vegetation etc.) • Limit mounting heights of lighting fixtures, or alternatively use footlights or bollard level lights. • Make use of minimum lumen or wattage in fixtures. • Make use of down-lighters, or shield fixtures. • Make use of low-pressure sodium lighting or other types of low impact lighting.

				• Make use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes. • The use of night vision or thermal security cameras are very effective and can replace security lighting entirely.
	Solar glint and glare impacts of the solar facility.	Negative Low (9)	Negative Low (9)	No mitigation measures are required
	Visual and sense of place impacts of the solar facility.	Negative Medium (30)	Negative Low (13)	• It is believed that renewable energy resources are essential to the environmental well- being of the country and planet (WESSA, 2012). Aesthetic issues are subjective, and some people find solar farms and their associated infrastructure pleasant and optimistic while others may find it visually invasive; it is mostly perceived as symbols of energy independence; and local prosperity. • The subjectivity towards the project in its entirety can be influenced by creating a "Green Energy" awareness campaign, educating the local community and potentially tourists on the benefits of renewable energy. This can be achieved by also hosting an 'open day' where the local community can have the opportunity to view the completed project which may enlist a sense of pride in the renewable energy project in their area. • Implement good housekeeping measures.
	Visual and sense of place impacts of the grid connection corridor	Negative Low (12)	Negative Low (12)	• It is believed that renewable energy resources are essential to the environmental well- being of the country and planet

	alternatives 1A, 1B, 1C, 2 and 3.			(WESSA, 2012). Aesthetic issues are subjective, and some people find solar farms and their associated infrastructure pleasant and optimistic while others may find it visually invasive; it is mostly perceived as symbols of energy independence; and local prosperity. • The subjectivity towards the project in its entirety can be influenced by creating a "Green Energy" awareness campaign, educating the local community and potentially tourists on the benefits of renewable energy. This can be achieved by also hosting an 'open day' where the local community can have the opportunity to view the completed project which may enlist a sense of pride in the renewable energy project in their area. • Implement good housekeeping measures.
	Visual and sense of place impacts of the grid connection corridor alternative 4.	Negative Low (12)	Negative Low (12)	
Social Impact Assessment (Appendix D7)	Direct and Indirect employment opportunities and skills development	Positive Low (15)	Positive Medium (36)	Enhancement: • It is recommended that local employment policy is adopted to maximise the opportunities made available to the local community. • The recruitment selection process should seek to promote gender equality and the employment of women wherever possible. • Vocational training programs should be established to promote the development of skills.
	Development of non-polluting, renewable energy infrastructure	Positive Medium (36)	Positive Medium (36)	• No enhancement identified

	Potential loss of agricultural land	Negative Medium (30)	Negative Low (22)	• The proposed mitigation measures for the construction phase should have been implemented at this stage. • Mitigation measures from the Soils and Agricultural Impact Assessment should also be implemented.
	Contribution to Local Economic Development (LED) and social upliftment	Positive Medium (48)	Positive High (72)	Enhancement: • A CNA must be conducted to ensure that the LED and social upliftment programmes proposed by the project are meaningful. • Ongoing communication and reporting are required to ensure that maximum benefit is obtained from the programmes identified, and to prevent the possibility for such programmes to be misused. • The programmes should be reviewed on an ongoing basis to ensure that they are best suited to the needs of the community at the time (bearing in mind that these are likely to change over time).
	Impact on tourism	Negative Low (24) / Positive Low (24)	Negative Low (24) / Positive Low (24)	• The impact rating is dependent on how the development is perceived by tourism. In some cases, renewable energy developments can be seen as an addition to the tourist industry in the area (positive low) or it can be viewed as a negative. The rating is subjective. • Due to the extent of the project no viable mitigation measures can be implemented to eliminate the visual impact of the PV panels, but the subjectivity towards the PV panels can be influenced by creating a "Green Energy" awareness campaign, educating the local community and tourists on the

				benefits of renewable energy. Tourists visiting the area should be made aware of South Africa's movement towards renewable energy. This might create a positive feeling of a country moving forward in terms of environmental sustainability. This could be implemented by constructing a visitor's centre on the property allocated to the proposed solar farm which should be open to school fieldtrips, the local community, and tourists
	Visual and sense of place impacts	Negative Low (28)	Negative Low (12)	• To effectively mitigate the visual impact and the impact on sense of place during the operational phase of the proposed project, it is suggested that the recommendations made in the Visual Impact Assessment (specialist study) should be followed in this regard
Palaeontological Impact Assessment (Appendix D6)	Destroy or permanently seal-in fossils at or below the surface that are then no longer available for scientific study	Negative Medium (48)	Negative Low (16)	• If fossil remains are discovered during any phase of construction, either on the surface or exposed by excavations the Chance Find Protocol (Section 13 of the Palaeontoloigcal Impact Assessment, Appendix D6) must be implemented by the ECO/site manager in charge of these developments. These discoveries ought to be protected (if possible, in situ) and the ECO/site manager must report to SAHRA (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za) so that mitigation (recording and collection) can be carry out by a paleontologist.

6.2.3 Impacts during the decommissioning phase

The physical environment will benefit from the closure of the solar facility since the site will be restored to its natural state. Table 6.6 provides a summary of the impacts during the decommissioning phase. The decommissioning phase will however potentially result in impact on soils, pressure on existing service infrastructure, surface water and the loss of permanent employment. Skilled staff will be eminently employable, and a number of temporary jobs will also be created in the process. Decommissioning of a PV facility will leave a positive impact on the habitat and biodiversity in the area as the area will be rehabilitated to its natural state.

Table 6.6: Impacts and the mitigation measures during the decommissioning phase

SPECIALIST STUDY	IMPACT	PRE-MITIGATION RATING	POST MITIGATION RATING	SUMMARY OF MITIGATION MEASURES
Terrestrial Biodiversity Impact Assessment (Appendix D1)	Direct habitat destruction	Negative Medium (45)	Negative Low (24)	• Peripheral impacts around the development footprint, on the surrounding vegetation of the area, should be avoided, while the rehabilitation of the site should be prioritised after construction has been completed and again after the decommissioning phase. Indigenous grass species that are present in this area should be sown. • Poisons for the control of problem animals must be avoided since the wrong use thereof can have disastrous consequences for birds of prey. The use of poisons for the control of rats, mice or other vermin must only be used after approval from an ecologist. • Limit pesticide use to non-persistent, immobile pesticides and apply in accordance with label and application permit directions and stipulations for terrestrial and aquatic applications. • Monitoring must be implemented during the decommissioning phase to ensure that minimal impact is caused to the fauna and flora of the area. • After the decommissioning phase the area must be rehabilitated.
	Habitat fragmentation	Negative Low (26)	Negative Low (9)	• Use existing facilities (e.g., impacted areas) to the extent possible to minimise the amount of new disturbance. • Disturbance in the wetlands must be minimised. • Decommissioning activities must remain within defined areas. No disturbance will occur outside these areas.

				• After decommissioning, infrastructure must be removed and disposed of in a responsible manner and the site has to be rehabilitated with indigenous species.
	Increased soil erosion and sedimentation	Negative Medium (30)	Negative Low (6)	• The project should be divided into as many phases as and where possible, to ensure that the exposed areas prone to erosion are minimal at any specific time. • Minimize the amount of land disturbance and implement stringent erosion and dust control practices. • Protect sloping areas and drainage channel banks that are susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction (decommissioning) camp and Work Areas. • Repair all erosion damage as soon as possible to allow for sufficient rehabilitation growth. • Control the flow of runoff to move the water safely off the site without destructive gully formation. • Protect all areas susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction (decommissioning) camp and Work Areas.
	Soil and water pollution	Negative Low (28)	Negative Low (6)	• Any excess or waste material or chemicals must be removed from the site and discarded in an environmentally friendly way. • Hazardous chemicals to be stored on an impervious surface protected from rainfall and storm water run-off. • Spill kits must be on-hand to deal with spills immediately. • All vehicles must be inspected for oil and fuel leaks on a regular basis. Vehicle maintenance yards on site must make provision for drip trays that

				will be used to capture any spills. Drip trays must be emptied into a holding tank and returned to the supplier. • After decommissioning all materials must be disposed of in a responsible manner.
	Air pollution	Negative Low (26)	Negative Low (9)	• A speed limit must be enforced on dirt roads (preferably 30-40km/h). • Implement standard dust control measures, including periodic spraying (frequency will depend on many factors including weather conditions, soil composition and traffic intensity and must thus be adapted on an on-going basis) of decommissioning areas and access roads, and ensure that these are continuously monitored to ensure effective implementation.
	Spread and establishment of alien invasive species	Negative Medium (30)	Negative Low (6)	• Control involves killing the plants present, killing the seedlings which emerge, and establishing and managing an alternative plant cover to limit re-growth and re-invasion. Weeds and invader plants will be controlled in the manner prescribed for that category by the CARA (Conservation of Agricultural Resources Act) or in terms of Working for Water guidelines. • Institute strict control over materials brought onto site, which must be inspected for seeds of noxious plants and steps taken to eradicate these before transport to the site. • Rehabilitate disturbed as quickly as possible to reduce the area where invasive species would be at a strong advantage and most easily able to establish. • Institute a monitoring programme to detect alien invasive species early, before they become established and, in the case of weeds, before the release of seeds. • After decommissioning, the site has to be rehabilitated by sowing indigenous grass species, if the landowner decides to not use the property

				for crop production. If it is to be used as grazing, it must be rehabilitated. The control and monitoring of declared invaders have to continue for one year after decommissioning.
	Negative effect of human activities and road mortalities	Negative Low (26)	Negative Low (8)	• No staff must be accommodated on the site. If practical, construction (decommissioning) workers must stay in one of the nearby towns/villages and transported daily to the site. • Educate construction (decommissioning) workers regarding risks and correct disposal of cigarettes. • More fauna is normally killed the faster vehicles travel. A speed limit must be enforced (preferably 40 km/hour). It can be considered to install speed bumps in sections where the speed limit tends to be disobeyed. (Speed limits will also lessen the probability of road accidents and their negative consequences). • Travelling at night must be avoided or limited as much as possible.
Avifauna Impact Assessment (Appendix D2)	Long-term or permanent degradation and modification of the receiving environment resulting in the loss of important avian habitats	Negative Medium (45)	Negative Low (20)	• Compile a rehabilitation plan (and biodiversity protocol) that will be implemented following the decommissioning phase, as required by legislation and regulation.
	Displacement of resident avifauna through increased disturbance	Negative Medium (36)	Negative Low (16)	• Compile a rehabilitation plan (and biodiversity protocol) that will be implemented following the decommissioning phase, as required by legislation and regulation.

6.3 SUMMARY OF IMPACTS AND RECOMMENDATIONS FROM SPECIALIST STUDIES

To address the key issues highlighted in the previous section the following specialist studies and processes were commissioned:

- Terrestrial Biodiversity Impact Assessment – M van der Westhuizen (see Appendix D1)
- Avifaunal Impact Assessment – Mora Ecological Services (see Appendix D2)
- Visual Impact Assessment – Donaway Environmental Consultants (see Appendix D3)
- Soils and Agricultural Impact Assessment – The Biodiversity Company (see Appendix D4)
- Heritage Impact Assessment – JA van Schalkwyk Heritage Consultants (see Appendix D5)
- Palaeontological Impact Assessment – Banzai Environmental (see Appendix D6)
- Social Impact Assessment – Donaway Environmental Consultants (see Appendix D7)
- Wetland Impact Assessment – M van der Westhuizen (see Appendix D8)

The following sections summarise the main findings from the specialist reports in relation to the key issues raised during the scoping phase.

6.3.1 Issue 1: Heritage and archaeological impacts

South Africa's heritage resources comprise a wide range of sites, features, objects and beliefs. According to Section 27(18) of the National Heritage Resources Act (NHRA), No. 25 of 1999, no person may destroy, damage, deface, excavate, alter, remove from its original position, subdivide or change the planning status of any heritage site without a permit issued by the heritage resources authority responsible for the protection of such site. In accordance with Section 38 of the NHRA, an independent heritage consultant was therefore appointed to conduct a Heritage Impact Assessment (HIA) to determine if any sites, features or objects of cultural heritage significance occur within the proposed site. The main question which needs to be addressed is:

> *"Will the proposed development impact on any heritage or archaeological artefacts?"*

According to the Heritage Impact Assessment (Appendix D5) cultural landscape qualities of the region are made up of a pre-colonial element consisting of very limited Stone Age and Iron Age occupation, as well as a much later colonial (farmer) component, which also gave rise to an urban and industrial (mining) component.

The impacts expected to occur will be of a low significance based on the fact that no sites of cultural significance or value was identified or discovered.

For this proposed project, the assessment has determined that no sites, features or objects of cultural heritage significance occur in the project area, therefore no permits are required from SAHRA or the PHRA. If heritage features are identified during construction, as stated in the

management recommendation, these finds would have to be assessed by a specialist, after which a decision will be made regarding the application for relevant permits.

From a heritage point of view, it is recommended that the proposed project be allowed to continue on acceptance of the mitigation measures presented and the conditions proposed.

6.3.2 Issue 2: Terrestrial Biodiversity Impacts

The potential impact of the proposed development on flora and fauna known to occur in the Free State Province had to be determined. The main question which needs to be addressed is:

"How will the proposed development impact on the ecology?"

The site is surrounded by various mining and agricultural activities.

According to the Terrestrial Biodiversity, Plant and Animal Species Impact Assessment (Appendix D1), negative impacts are expected to occur during the construction, operation and decommissioning phases. There are three major categories of impacts on biodiversity namely:

- Impacts on habitat resulting in loss, degradation and / or fragmentation.
- Direct impacts on fauna and flora and species, for example plants and animals that are endemic / threatened / specially adapted to a habitat, will not be able to survive if that habitat is destroyed or altered by the development.
- Impact on natural environmental processes and ecosystem functioning. This can lead to an accumulated effect on both habitat and species.

This biodiversity assessment focused on the description of ecosystem- and species-related biodiversity. It can be expected that if ecosystem diversity is managed effectively, species and genetic diversity should also be protected. Emphasis was therefore placed on the ecosystem diversity (landscape/habitat types) within the proposed site, with reference to biota observed and expected to utilise these landscapes or habitat types.

Mitigation measures are provided that would reduce the impacts from a medium to a lower significance. Furthermore, no high sensitivity / no-go areas were identified in the project area. Disturbance should still be limited as far as possible, especially in the wetlands.

The specialist confirms that if all mitigation measures are implemented, the development can be supported from a biodiversity point of view.

6.3.3 Issue 3: Wetland / Riparian Impacts

The potential impact of the proposed development on wetlands known to occur on site, had to be determined. The main question which needs to be addressed is:

"How will the proposed development impact on the wetlands?"

According to the Wetland Impact Assessment (Appendix D8), the depression wetland is expected to be impacted by the development. As vegetation surrounding the wetlands are removed, runoff and sediment load to the depression wetland will increase. Even though the depressions or dams are artificial, they provide ecosystem services and create habitat for plant and animal species.

The two Valley Bottom Wetlands are located in the proposed grid connection corridor alternatives. The impacts of the power line are not expected to be serious, as vegetation will not be completely cleared. It will be disturbed to some extent as power lines are constructed during the construction phase and also during maintenance activities to be undertaken in the operational phase.

The impact of compaction, soil erosion and sedimentation will be relevant mostly to the depression wetlands and to a lesser extent on the unchannelled valley bottom wetlands. The use of heavy machinery during the construction process of the development will result in the compaction of soil, resulting in decreased infiltration of rainwater and increased surface run-off volumes and velocities leading to a greater erosion risk. The hardened surfaces of the road and compacted soils of the proposed development area will also lead to an increase in surface run-off during storms. This can lead to erosion in the cleared areas and sedimentation in the wetlands.

Soil erosion also promotes a variety of terrestrial ecological changes associated with disturbed areas, including the establishment of alien invasive plant species, altered plant community species composition and loss of habitat for indigenous fauna and flora.

Disturbance to the unchannelled valley bottom wetlands during construction and maintenance of the power line is inevitable as heavy vehicles will operate in the area. As habitat is disturbed, fauna and flora will be negatively impacted. Vegetation structures may change, affecting wetland properties and fauna. The unchannelled valley bottom 1 (UVB1) wetland is already disturbed by agricultural activities and UVB2 was disturbed by the development of Mercury Substation, power lines and roads that traverse it. The wetlands are however still functional.

The depression wetland (i.e. artificial dam) is not considered to be a no-go area for the development and placement of infrastructure.

Specific mitigation measures need to be implemented in the areas surrounding the wetlands to prevent any negative impacts.

Provided that all the mitigation measures and recommendations for wetlands are strictly adhered to the development of the solar development can be supported.

6.3.4 Issue 4: Avifaunal Impacts

The potential impact of the proposed development on birds known to occur in Free State Province had to be determined. The main question which needs to be addressed is:

"How will the proposed development impact on the avifauna?"

According to the Avifaunal Assessment (Appendix D2), the overall avifaunal species occurring at the proposed PV site are dominantly represented by chats, swifts, pipits, kites, martins, wagtails, lapwings, herons and cisticolas. One bird species of priority, the Lanner Falcon, was encountered during the transect surveys. The Lanner Falcon was encountered three times, where it was seen once in the Grassland ecosystem and twice approximately 70 m perching on trees.

The overall avifaunal species occurring along the grid connection corridor alternatives are dominantly represented by pigeons, doves, geese, and guineafowls. One bird species of priority, the Black-winged Kite was encountered during the transect surveys. The Black-winged Kite was encountered once, where it was seen perched on an existing power line near the Mercury substation.

The Avifauna Impact Assessment confirms that the area is of a low sensitivity. Assessments of the present waterbodies were conducted where only species of Least Concern were encountered.

All impacts identified and assessed have a significance rating of medium before mitigation and low after the implementation of mitigation. The overall impacts (including cumulative) for the project are considered to be low and will not cause detrimental impacts to the avifauna species located within the development area and surrounds.

As a result, from an avifaunal perspective, there is no objection to the development of the proposed Naos Solar PV Project One and associated infrastructure, provided to the recommended mitigation measures are strictly followed.

6.3.5 Issue 5: Visual Impacts

Due to the extent of the proposed photovoltaic solar plant it is expected that the plant will result in potential visual impacts. The main question which needs to be addressed is:

"To what extent will the proposed development be visible to observers and to what extent will the landscape provides any significant visual absorption capacity"

The Visual Impact Assessment (Appendix D3) confirms that the significance of the visual impact will be a "Negative Low Impact". Sensitive receptors likely to be impacted by the proposed development are the nearby property owners and nearby roads. However, a large part of the visual landscape is still reflecting a farming and intensive mining landscape with a much lower visual quality

The construction and operational phase of the proposed Naos Solar PV Project One and its associated infrastructure, will have a visual impact on the study area, especially within (but not restricted to) a 1km radius of the proposed project. The visual impact will differ amongst places, depending on the distance to the solar facility. Receptors that might be the most sensitive to the proposed development are residents living and working on nearby farms, people travelling on the Vermaasdrift and S643 roads and three nearby tourism / recreational facilities. The proposed development is visible from two of the three tourism facilities and within close proximity. The three facilities are Wawielpark Holiday Resort (visible), Clementia Function and Conference Venue (visible) and Seekoeigat camping and fishing facility (not visible but still in very close proximity).

The tourism sector in the area is healthy due to the Vaal River. The Vaal River is seen as a popular recreational attraction where people come to fish, relax and pursue other water recreational activities.

The construction and operational phase of the power line will have a visual impact on the study area, especially within (but not restricted to) a 1km radius. The visual impact will differ amongst places, depending on the distance to the power line. Receptors that might be the

most sensitive to the proposed development are residents living and working on nearby farms, and people travelling the Vermaasdrift and S643 roads.

Due to the extent of the project, no viable mitigation measures can be implemented to eliminate the visual impact of the PV facility entirely, but the possible visual impacts can be reduced. Several mitigation measures have however been proposed regardless of whether mitigation measures will reduce the significance of the anticipated impacts, they are considered good practice and should be implemented and maintained throughout the construction, operational and decommissioning phases of the project, if possible.

Extra caution and more intensive mitigation should be considered for the three tourism / recreational facilities located nearby. The impact on visitors should be kept to a minimum. It is recommended that project management keeps an open "communication line" between them and the tourism facilities throughout the project, especially during construction, to take into account and consider all reasonable concerns these facilities may have.

In terms of possible landscape degradation, the landscape does not appear to have any specific protection and is characterised by farming and mining development. No buffer areas or areas to be avoided are applicable for this development.

Considering all positive factors of such a development including economic factors, social factors and sustainability factors, especially in a semi-arid country, the visual impact of this proposed development will be insignificant and is suggested that the development commence, from a visual impact point of view.

6.3.6 Issue 6: Agricultural / impacts on the soil

In order to determine the potential impacts that the proposed development will have on agricultural production, the soil forms and current land capability of the area where the proposed project will be situated was investigated. The main question which needs to be addressed is:

"To what extent will the proposed development compromise (negative impacts) or enhance (positive impacts) current and/or potential future agricultural production?"

The Soils and Agricultural Impact Assessment (Appendix D4) indicates that four main sensitive soil forms were identified within the site, namely the Ermelo, Clovelly, Avalon and Kransfontein soil forms. The land capability sensitivities indicate land capabilities with "Low" and "Moderate high" sensitivities following the DEA agricultural screen Tool, (2023). However, the soil baseline findings despite some of the areas which were identified as "High" sensitivity. Overall, the site can be assigned within a "Low to Medium" land capability potential.

The site is associated with both non-arable and arable soils. However, the available climatic conditions of low annual rainfall and high evapotranspiration potential severely limits crop production significantly in the arable soils resulting in land capabilities with "Low" and "Moderate high" sensitivities. The land capabilities associated with the site are suitable for rainfed cropping, irrigated cropping and livestock grazing, which corresponds with the current land use.

It is the specialist's opinion that the proposed Naos Solar PV Project One will have an overall low residual impact on the agricultural production ability of the land. The proposed activities

will result in minimum segregation of some agricultural land which is characterised as historical with a low agricultural economic potential. Such crop lands are associated with sandy soils characterised with poor drainage potential for cropping practices. Infrastructure development can occur on these areas which were considered as previously high productive agricultural lands.

The landowners have provided consent to use the land for the proposed Solar PV project, to increase the economical land capability. The impacts from the grid pylons will be negligible, but the project development should minimise pylon placement within existing and used crop areas. It is therefore the specialist` recommendation that, the Naos Solar PV Project One be favourably considered as proposed.

6.3.7 Issue 7: Socio-economic impacts

A Social Impact Assessment (Appendix D7) has been compiled in order to provide a description of the environment that may be affected by the activity and the manner in which the environment may be affected by the proposed facility; to provide a description and assessment of the potential social issues associated with the proposed facility; and the identification of enhancement and mitigation aimed at maximizing opportunities and avoiding and or reducing negative impacts (refer to Appendix D7). The main question which needs to be addressed is:

"How will the proposed development impact on the socio-economic environment?"

There are some vulnerable communities within the project area that may be affected by the development of Naos Solar PV Project One and its associated infrastructure. These communities may include the communities of Viljoenskroon as well as its surroundings. Traditionally, the construction phase of a PV solar development is associated with most social impacts. Many of the social impacts are unavoidable and will take place to some extent but can be managed through the careful planning and implementation of appropriate mitigation measures. Several potential positive and negative social impacts have been identified for the project, however an assessment of the potential social impacts indicated that there are no perceived negative impacts that are sufficiently significant to allow them to be classified as "fatal flaws".

- Based on the social impact assessment, the following general conclusions and findings can be made:
- The potential negative social impacts associated with the construction phase are typical of construction related projects and not just focussed on the construction of solar PV projects (these relate to an influx of non-local workforce and jobseekers, intrusion, and disturbance impacts (i.e., noise and dust, wear and tear on roads) and safety and security risks and could be reduced with the implementation of the mitigation measures proposed. The significance of such impacts on the local communities can therefore be mitigated.
- The development will introduce employment opportunities during the construction phase (temporary employment) and a limited number of permanent employment opportunities during operation phase.

- The proposed project could assist the local economy in creating entrepreneurial growth and opportunities, especially if local business is involved in the provision of general material, goods and services during the construction and operational phases. This positive impact is likely to be compounded by the cumulative impact associated with the development of several other solar facilities within the surrounding area, and because of the project's location within an area which is characterised by high levels of solar irradiation, and which is therefore well suited to the development of commercial solar energy facilities.
- The proposed development also represents an investment in infrastructure for the generation of non-polluting, Renewable Energy, which, when compared to energy generated because of burning polluting fossil fuels, represents a positive social benefit for society.
- When considering Naos Solar PV Project One, it is also important to consider the cumulative social impacts that may arise with other proposed solar PV projects in the area.
- It should be noted that the perceived benefits associated with the project, which include RE generation and local economic and social development, outweigh the perceived impacts associated with the project.

The proposed mitigation measures should be implemented to limit the negative impacts and enhance the positive impacts associated with the project. Based on the social assessment, the following recommendations are made:

- The appointment of a CLO to assist with the management of social impacts and to deal with community issues, if feasible.
- It is imperative that local labour be sourced, wherever possible, to ensure that benefits accrue to the local communities. Efforts should be made to involve local businesses during the construction activities, where possible. Local procurement of labour and services / products would greatly benefit the community during the construction and operational phases of the project.
- Local procurement of services and equipment is required where possible to enhance the multiplier effect.
- Involve the community in the process as far as possible (encourage co-operative decision making and partnerships with local entrepreneurs).
- Employ mitigation measures to minimise the dust and noise pollution and damage to existing roads.
- Safety and security risks should be considered during the planning / construction phase of the proposed project. Access control, security and management should be implemented to limit the risk of crime increasing in the area.

The proposed project and associated infrastructure are unlikely to result in permanent damaging social impacts. From a social perspective it is concluded that the project could be developed subject to the implementation of recommended mitigation measures and management actions identified for the project.

6.3.8 Issue 8: Paleontological Impacts

South Africa's heritage resources comprise a wide range of sites, features, objects and beliefs. According to Section 27(18) of the National Heritage Resources Act (NHRA), No. 25 of 1999, no person may destroy, damage, deface, excavate, alter, remove from its original position, subdivide or change the planning status of any heritage site without a permit issued by the heritage resources authority responsible for the protection of such site. The main question which needs to be addressed is:

"How will the proposed development impact on the Palaeontological resources?"

According to the Palaeontological Impact Assessment (Appendix D6) underlain by Quaternary sands, the Vryheid Formation (Ecca Group, Karoo Supergroup), Hekpoort, Stubenkop and Daspoort Formations of the Pretoria Group (Transvaal Supergroup). The updated geology also indicates that the Malmani Subgroup of the Chuniespoort Group (Transvaal Supergroup) is present in the development. The Pretoria Group sedimentary rocks in and near the study area are extensively intruded, and locally metamorphosed, by sills of diabase. The diabase has a Zero Palaeontological Sensitivity. However, the existence of the diabase rocks would have had a thermal metamorphic effect on nearby sediments and would decrease the chance of fossil preservation.

According to the PalaeoMap of the South African Heritage Resources Information System (SAHRIS) the Palaeontological Sensitivity of the Vryheid Formation is Very High, that of the Daspoort Formation is High, while that of the Hekpoort Formation and Quaternary soils are Medium. The Palaeontological sensitivity of the Stubenkop Formation is Low, while that of diabase is Zero (Almond et al, 2013; SAHRIS website).

A site-specific field survey of the development footprint was conducted on foot and by motor vehicle on 13 August 2022. No fossiliferous outcrop was detected in the proposed development.

The apparent rarity of fossil heritage in the proposed development footprint suggests that the impact of the development will be of a Low significance in palaeontological terms. It is therefore considered that the proposed development will not lead to damaging impacts on the palaeontological resources of the area. The construction of the development may therefore be permitted in its whole extent, as the development footprint is not considered sensitive in terms of palaeontological resources

6.3.9 Risk Assessment for battery storage system

Battery storage facilities are a relatively new technology, particularly in South Africa. Batteries, as with most electrical equipment, can be dangerous and may catch fire, explode or leak dangerous pollutants if damaged, possibly injuring people working at the facility or polluting the environment. Common failure scenarios of Li-ion batteries include: electrical, mechanical, and thermal. The potential hazards associated with them are fire with consequent emission of gas and explosion. The major risks include thermal runaway, difficulty of fighting battery fires, failure of control systems and the sensitivity of Li-ion batteries to mechanical damage and electrical transients.

As with any fire or explosion, a potential consequence of Li-ion battery fires is the endangerment of life and property. These consequences are assessed based on their severity and likelihood. First, the severity of this consequence changes based on the quantity of cells in a system, as well as the system's proximity to people and property. Therefore, the size and location of the installation should be taken into consideration. For the Naos Solar PV Project One the location of the BESS and the fact that the area is sparsely populated will reduce the risk associated with toxic chemicals, flammability and overpressure from explosions. The risk level is seen to be of a low risk that is unlikely to occur with the proper safety measures taken as mitigation. Provided that the facility is designed and managed properly, and the batteries are handled in the manner prescribed by the manufacturer, an incident is unlikely to happen. However, because of the risk, special management actions are recommended in the EMPr to reduce the risk of an incident and manage an incident should one ever occur.

6.4 SENSITIVITY ANALYSIS

The sensitivity analysis undertaken as part of the BAR focusses on providing an understanding of the environmentally sensitive areas and features identified within the development footprint proposed for Naos Solar PV Project One, as well as the alternative grid connection corridors under assessment. This section considers the findings of each of the independent specialist studies undertaken for the development and considers the sensitive features and areas identified, including the location, the sensitivity rating of the features or areas as well as the associated buffers recommended by the specialist (where a buffer is considered to be relevant). The sensitive areas and features identified are also displayed on the sensitivity maps included as Figures H of this BA report.

The following points below provide the sensitivity analysis for the Naos Solar PV Project One:

Ecology:

The Terrestrial Biodiversity Impact Assessment (refer to Appendix D1) has considered the features present within the site and development footprint and has made the following observations in this regard.

The site is disturbed to a great extent. Some sections are completely disturbed by agricultural fields or planted pastures. These sections have a low sensitivity as there is little natural vegetation left. Some sections are indigenous grassland in a varying degree of disturbance. None of the vegetation is a pristine condition, but some are only somewhat disturbed. The vegetation unit in which the project area falls is endangered and the species diversity is high. The less disturbed areas therefore have a medium-high sensitivity and the more disturbed sections have a medium or medium-low sensitivity.

Refer to Figure 6.1 for the ecological sensitivity map.

The specialist further confirms that no high sensitivity / no-go areas were identified in the site. Disturbance should still be limited as far as possible, especially in the wetland features present within the PV site and the grid connection corridor alternatives.

Wetland Areas:

The Wetland Impact Assessment (refer to Appendix D8) has considered the features present within the development footprint and has made the following observations in this regard:

Two wetland types were identified to be associated with the proposed Naos Solar PV Project One (Figure 6.2):

- Exorheic depression (artificial dam) present within the development footprint of the PV site; and
- Unchannlelled valley bottom wetlands present within the grid connection corridor alternatives.

The power line connection and service roads will cross two valley bottom wetlands. This can be supported if disturbance in these features is kept to a minimum. The artificial dam is not considered to be a no-go area for development or placement of infrastructure.

With the avoidance of the sensitive depression wetland feature located in the development area and the limitation of disturbance of wetlands located in the grid connection corridor alternatives the development can be considered as appropriate from a wetland perspective.

Avifauna:

No specific areas of sensitivity have been identified from an avifauna perspective (Avifauna Impact Assessment, Appendix D2).

Therefore, from an avifauna perspective, no areas have been identified as no-go for the development of the Naos Solar PV Project One and associated infrastructure.

Heritage:

No sites, features or objects of cultural significance from the Stone Age, Iron Age or the historic period were identified on site.

Therefore, no specific features of sensitivity have been identified from a heritage perspective.

Agriculture:

Various crop field boundaries were identified by means of the DEA Screening Tool (2022), which are predominantly characterised by “High” sensitivities, even though some of the areas are historical crop fields (see Figure 6 3). It is the specialist’s opinion that the proposed Naos Solar PV Project One will have an overall low residual impact on the agricultural production ability of the land. The proposed activities will result in minimum segregation of some agricultural land which is characterised as historical with a low agricultural economic potential. Such crop lands are associated with sandy soils characterised with poor drainage potential for cropping practices. Infrastructure development can occur on these areas which were considered as previously high productive agricultural lands. The landowners have given consent to use the land for the proposed Solar PV project, to increase the economical land capability. The impacts from the grid pylons will be negligible, but the project development should minimise pylon placement within existing and used crop areas. (Soils and Agricultural Impact Assessment, Appendix D4).

Due to the location of the site within areas which are under crop production, or have historically been under crop production, an Agricultural Economic Assessment (Appendix D9) has been undertaken. The approach adopted for the assessment was to consider the agricultural potential of the grain fields as well as the carrying capacity of the veld and calculate the potential income from the fields and also look at the potential other farming

income after the implementation of Naos Solar PV Project One. This assessment also responds to the feedback received from the Free State Department of Agriculture and Rural Development (DARD) following receipt of the Notification of the Basic Assessment Process which indicated that the proposed development is unsupported within the site as infringement on high potential agricultural land would occur.

This report confirms that the Farm Waterford No. 573 consists of 155 hectares grain fields and 651 hectares planted pasture and natural veld. The report also confirms that this is a well-managed farm and good farming practices are applied to optimise the yield of the farm. The farm is also planned correctly and planned fences are in place.

The physical soil maps indicated that the long-term maize yield is 3.25 ton/ha and the caring capacity of the veld is 7 hectares per Large Stock Unit.

At the current grain prices and the current inputs at a yield of 3,35 ton, it is very difficult to make a profit. Even at an 80% calf percentage, the profits per livestock unit is low but it is still positive.

Discussions were held with the farmers which indicated that they still want to better the production of the farm by adding a solar energy facility and building a new irrigation dam that will be filled with water pumped from the Vaal River and using gravitation to irrigate the planned fields.

With the development of the new Naos Solar PV Project One, there will be new farming opportunities. The development of the solar facility makes it possible to harvest rainwater and to use this rainwater for irrigation. The second option is to start a sheep enterprise within the boundaries of the solar facility. The sheep enterprise will also double the income for the livestock enterprise because it is a fact that the sheep income is normally double that of a weaner calf system.

If only the 155 hectares crop field is used only 34% of the rainwater harvested on this field will be enough to produce the same amount of maize as on the 155-hectare dryland. An irrigation unit of 35 hectare is needed to produce the same amount of grain but at a profit. This plan of rainwater harvesting will fit into the long-term planning of the landowners. If the harvested rainfall is used to plant organic vegetables the income per hectare will be much higher and there will be extra work opportunities created.

With the current situation (i.e. avoidance of crop areas), work opportunities are going to be lost. The grain fields will be converted to planted pastures and the livestock enterprise will be expanded without the creation of extra work opportunities.

If the assumption is made that the 155 cultivated hectares will support two workers the 35-hectare irrigation maize will replace the job opportunity for these workers. For vegetable production every 5 hectares will support 1 work opportunity. With the known increased income from the vegetables, the farmers can support the extra work opportunities. This means that the irrigation portion with vegetables will create an extra 5 permanent jobs. Sheep production is also more labour-intensive than cattle production. Sheep farming makes use of double the workers than that of a cattle farm, so it can be expected that an extra 2 jobs will be created. These job opportunities don’t include the permanent jobs that Naos Solar PV Project One is expected to create.

The specialist has indicated that Naos solar PV Project One will be an asset for the agricultural sector rather than an overall liability and therefore should be considered favourably or supported by the Free State Department of Agriculture and Rural Development. Further comment and feedback has been sought from the Free State Department of Agriculture and Rural Development and will be included in the Final Basic Assessment Report, if obtained.

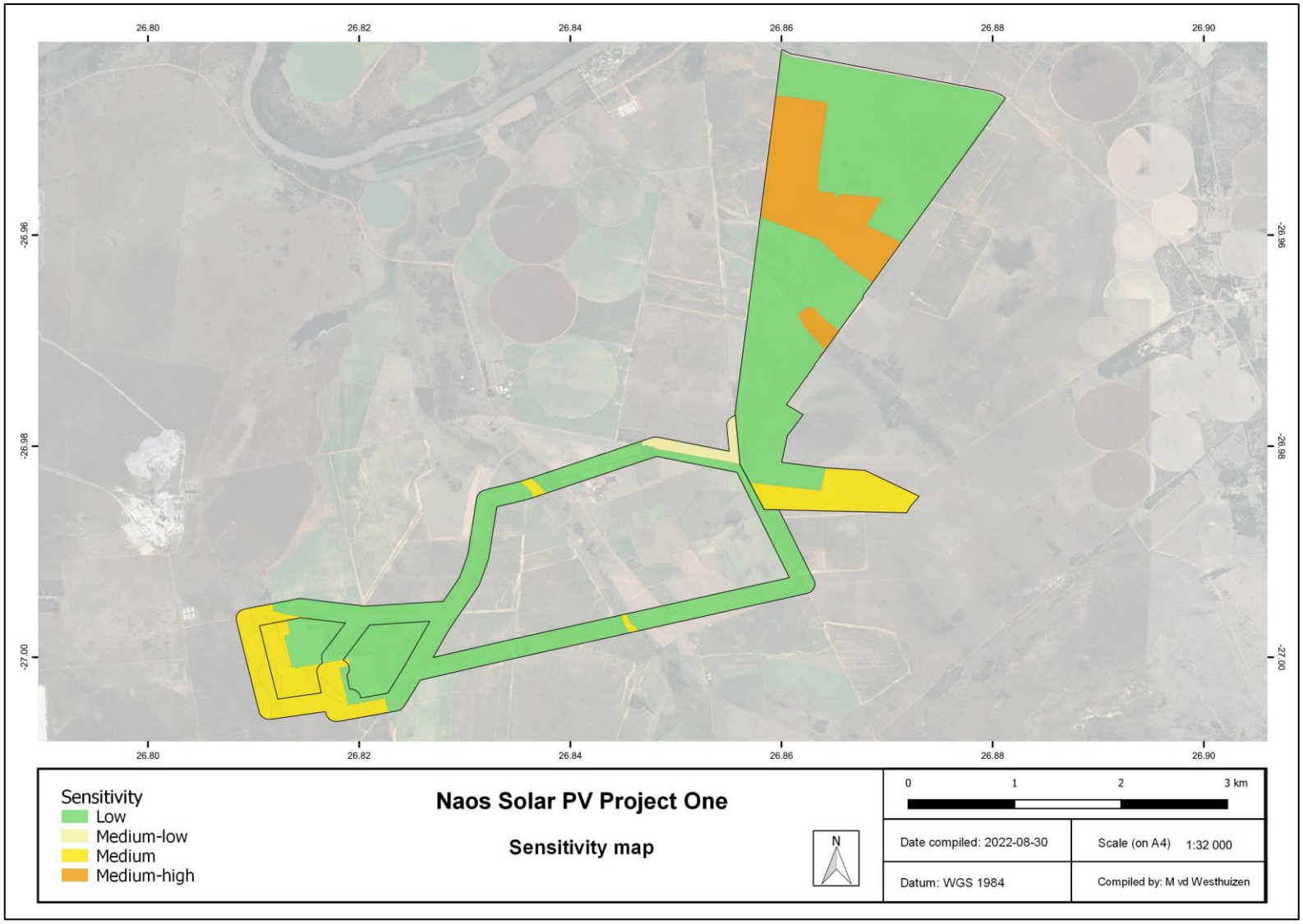


Figure 6.1: Ecology Sensitivity Map

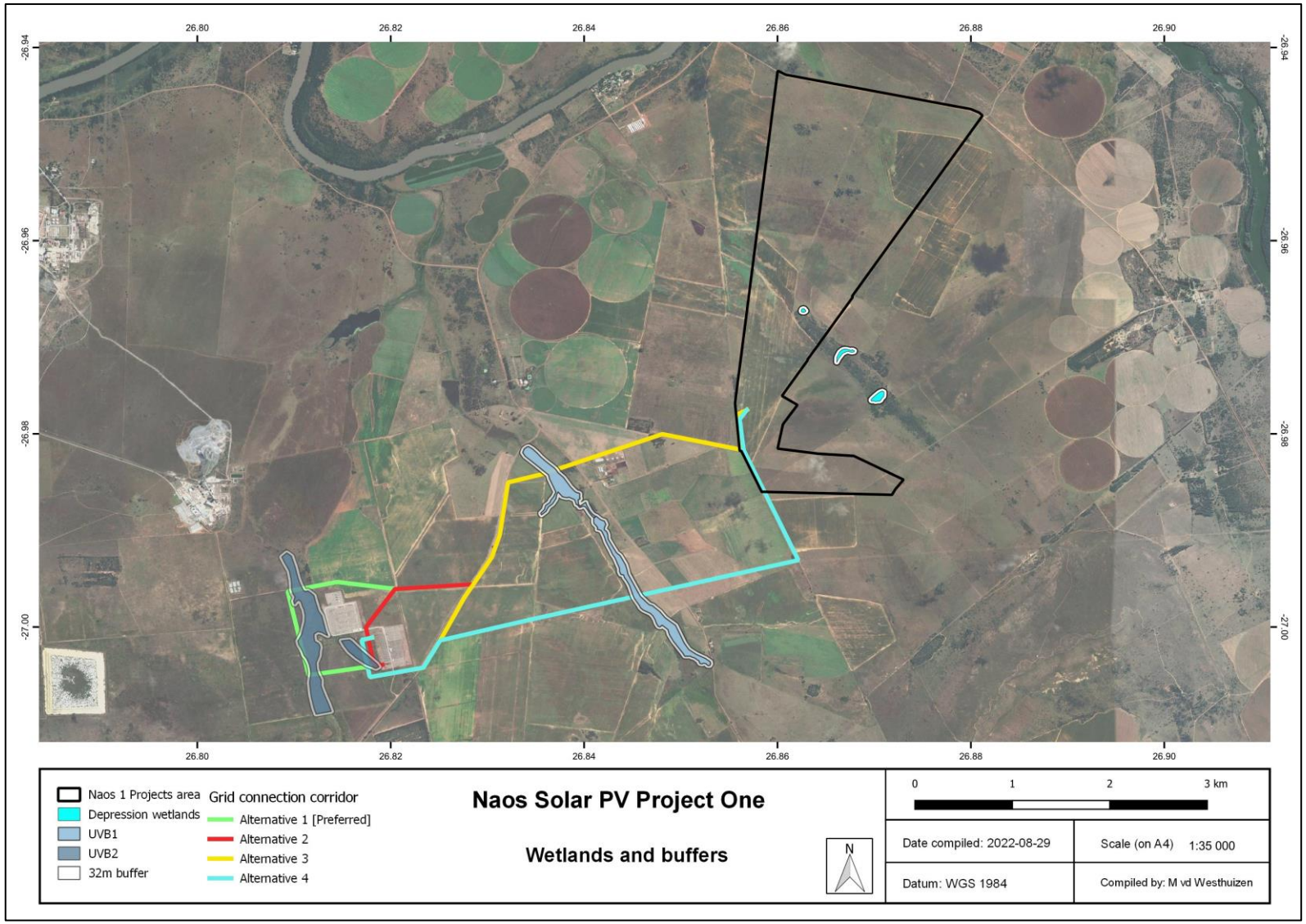


Figure 6.2: Wetland Sensitivity Map

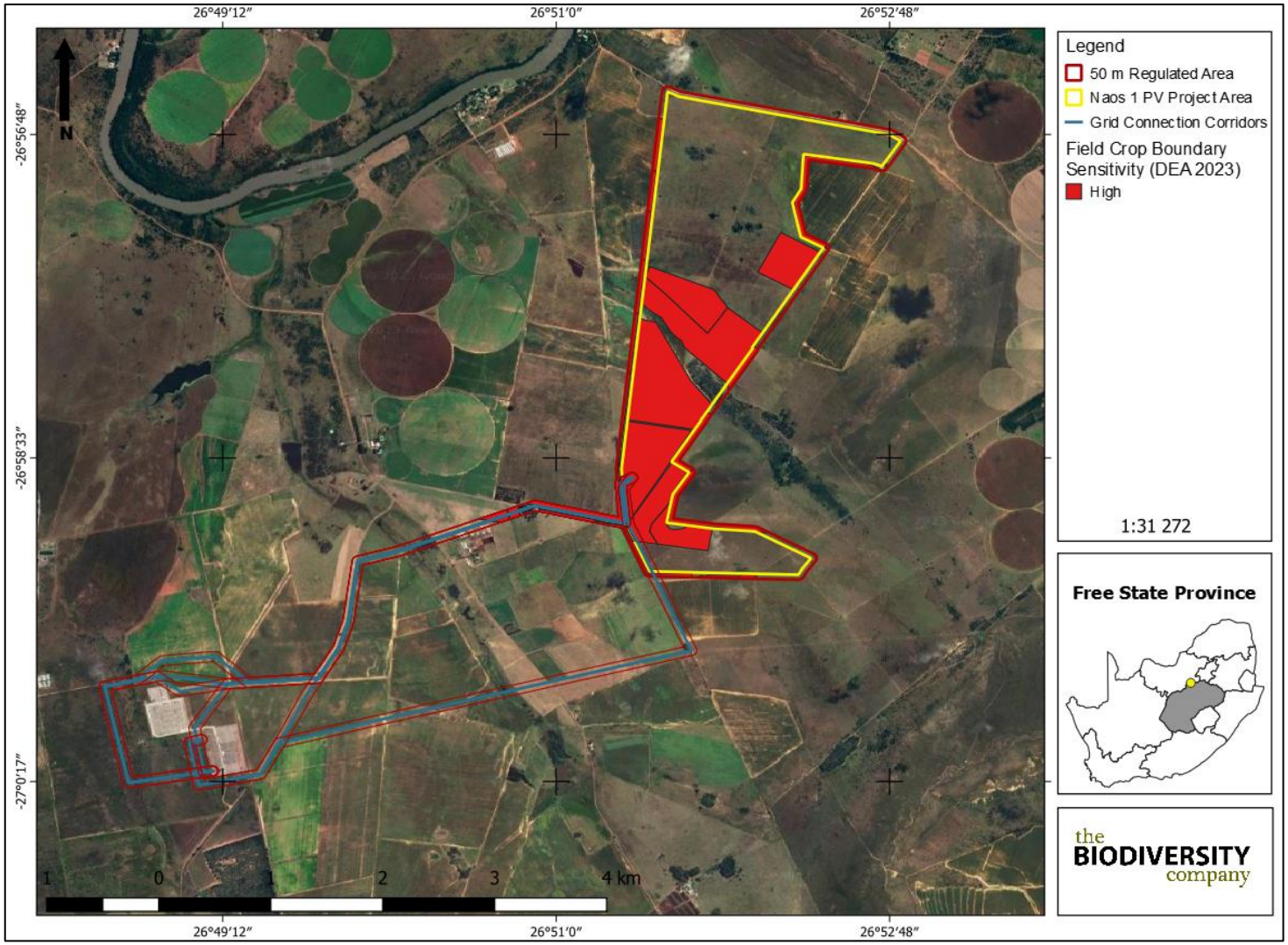


Figure 6.3: Crop Boundary Sensitivity Map

Visual:

No specific areas of sensitivity have been identified from a visual perspective (Visual Impact Assessment, Appendix D3). Therefore, from a visual perspective, no areas have been identified as no-go for the development of Naos Solar PV Project One and associated infrastructure.

Palaeontology:

No palaeontological no-go areas have been identified for the project (Palaeontological Impact Assessment, Appendix D6). Therefore, from a palaeontological perspective, no areas have been identified as no-go for the development of Naos Solar PV Project One and associated infrastructure.

Social:

No specific areas of sensitivity have been identified from a social perspective (Social Impact Assessment, Appendix D7). Therefore, from a social perspective, no areas have been identified as no-go for the development of Naos Solar PV Project One and associated infrastructure.

6.5 COMPARATIVE ASSESSMENT OF ALTERNATIVES

Specific alternatives associated with the Naos Solar PV Project One has been proposed by the developer which are under assessment as part of this BA Process. The details of the alternatives are as follows:

Grid Connection Corridor Alternatives

The 132kV power line to connect the facility to the 132/400kV Mercury Main Transmission Substation is under assessment within a 200m wide grid connection corridor. Six alternative routes are being considered. Refer to Figure 6.5.

The lengths of the six power line alternatives are as follow:

- Power Line Alternative 1A – up to 8km
- Power Line Alternative 1B (technically preferred) – up to 8km
- Power Line Alternative 1C – up to 8km
- Power Line Alternative 2 – up to 7km
- Power Line Alternative 3 – up to 7km
- Power Line Alternative 4 – up to 7.5km

Collector Substation Alternatives

Two collector substation alternative locations are under assessment. Specific internal power lines to connect the collector substation to the main grid connection corridor, which will ultimately evacuate the generated power into the national grid, is also being proposed as part of the required grid connection infrastructure.

Should the three developments (i.e. Naos Solar PV Project One, Two and Three) all be developed then there would be an overlap of the internal 33kV/132kV power lines that will be shared between the facilities to reduce the extent of linear infrastructure required).

It must be noted that Collector Substation Option 1 is put forward as the technically preferred option for the project layout. Refer to Figure 6.4.

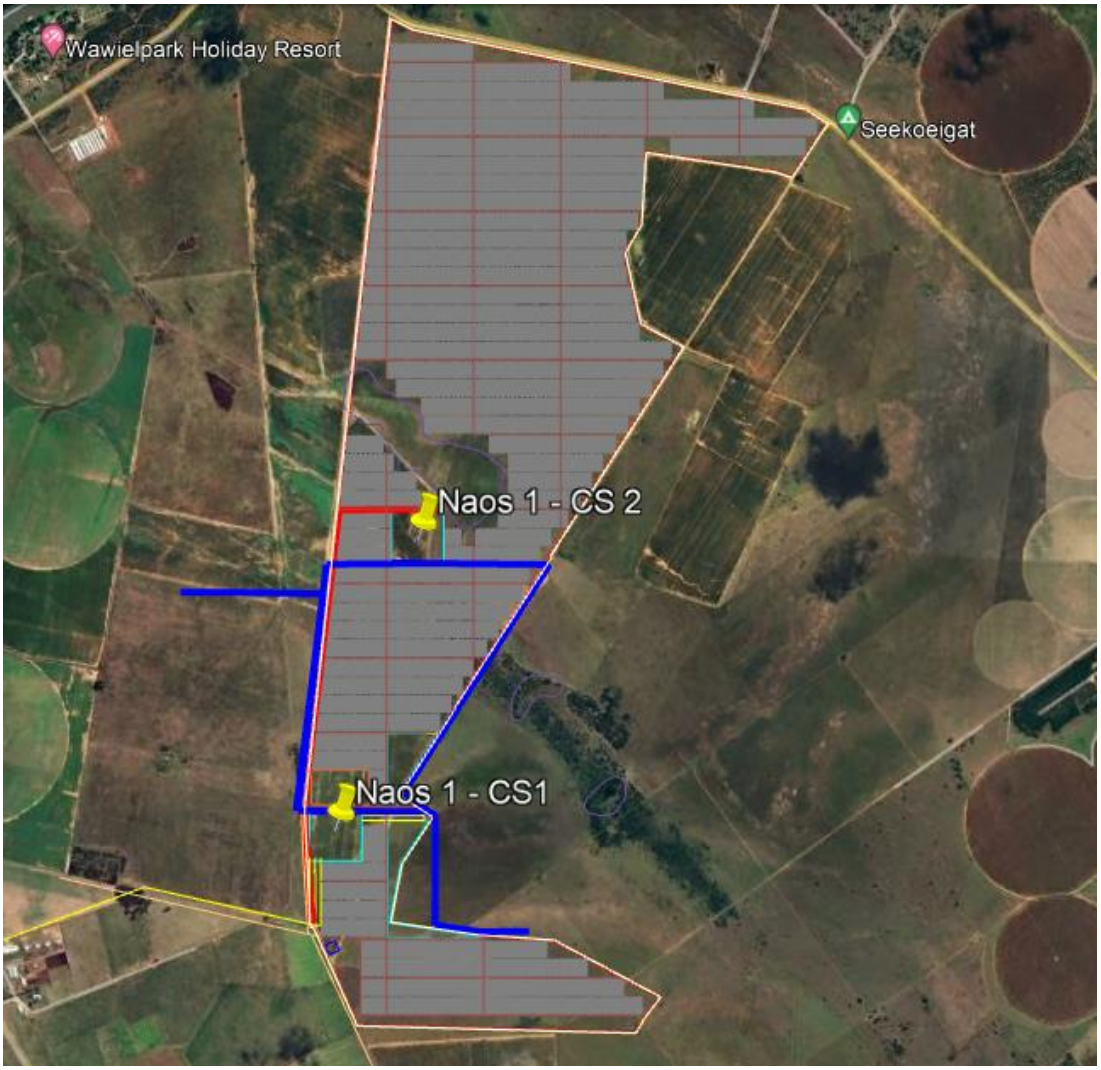


Figure 6.4: Internal grid connection solution, with two collector substation (CS) alternative locations, for Naos Solar PV Project One (red lines = Naos 1 132kV Eskom power line connecting to the main grid connection corridor for each collector substation alternative, blue lines = Naos 2 & 3 132kV power lines crossing over the Naos Solar PV Project One

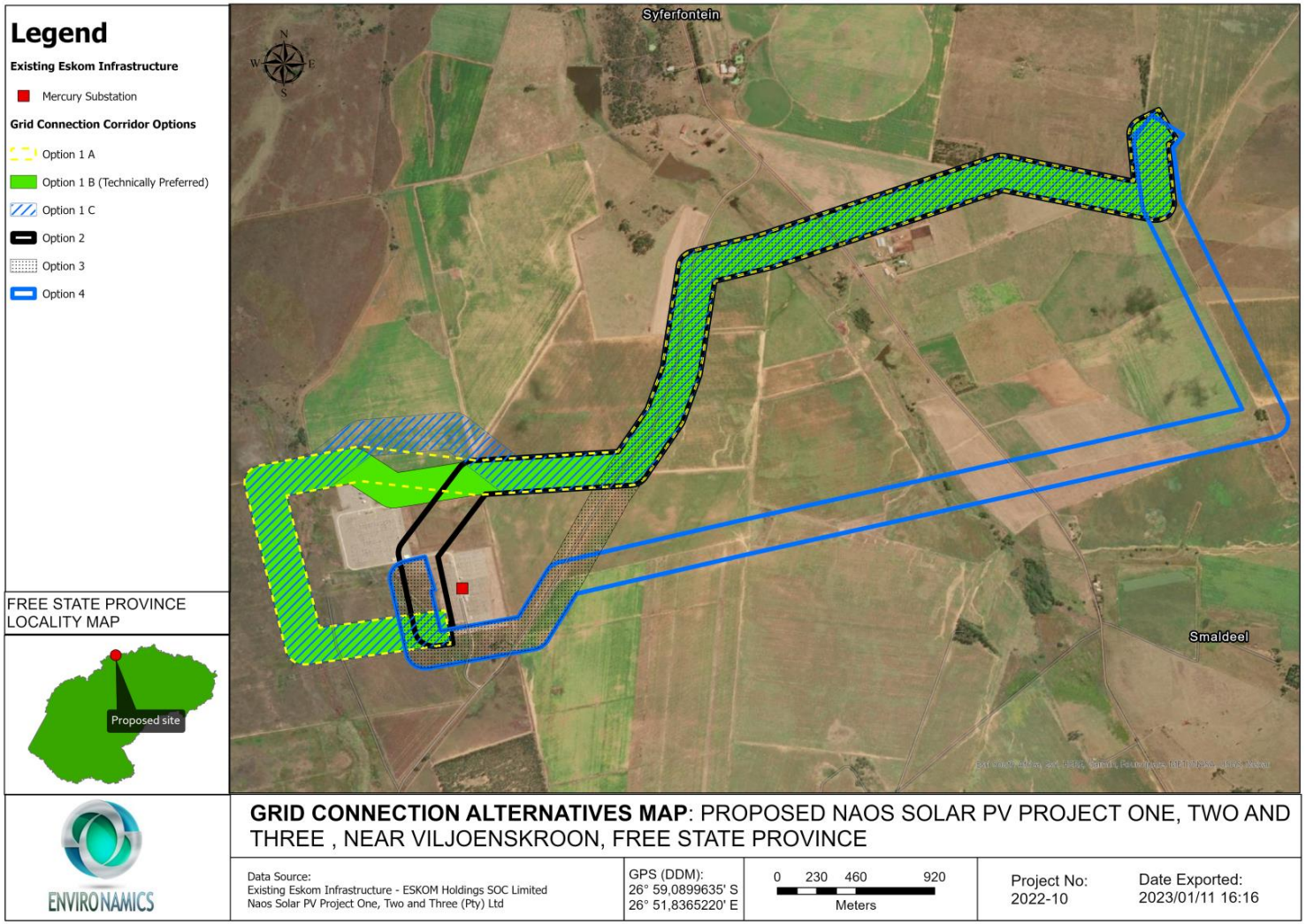


Figure 6.5: Six grid connection corridor alternatives under assessment to connect Naos Solar PV Project One to the existing 132/400kV Mercury Main Transmission Substation

Main Access Road Alternatives

In order to gain access to the site four alternative main access routes are being proposed for the development. These include the following:

- Preferred Access Road (Main Road) - 12.6km
- Alternative 1 – 25.6km
- Alternative 2 – 27.5km
- Alternative 3 – 14.6km

The technically preferred alternatives are the use of the Main Road and Alternative 2 collectively for the project as these two options provide the most technically sensible solution for the transportation of goods and services to and from the sites, including consideration of the road requirement for the transportation of the transformer. It is therefore requested that the Main Road and Alternative 2 both be authorised for the developments.

Refer to the Figure 6.6 below.

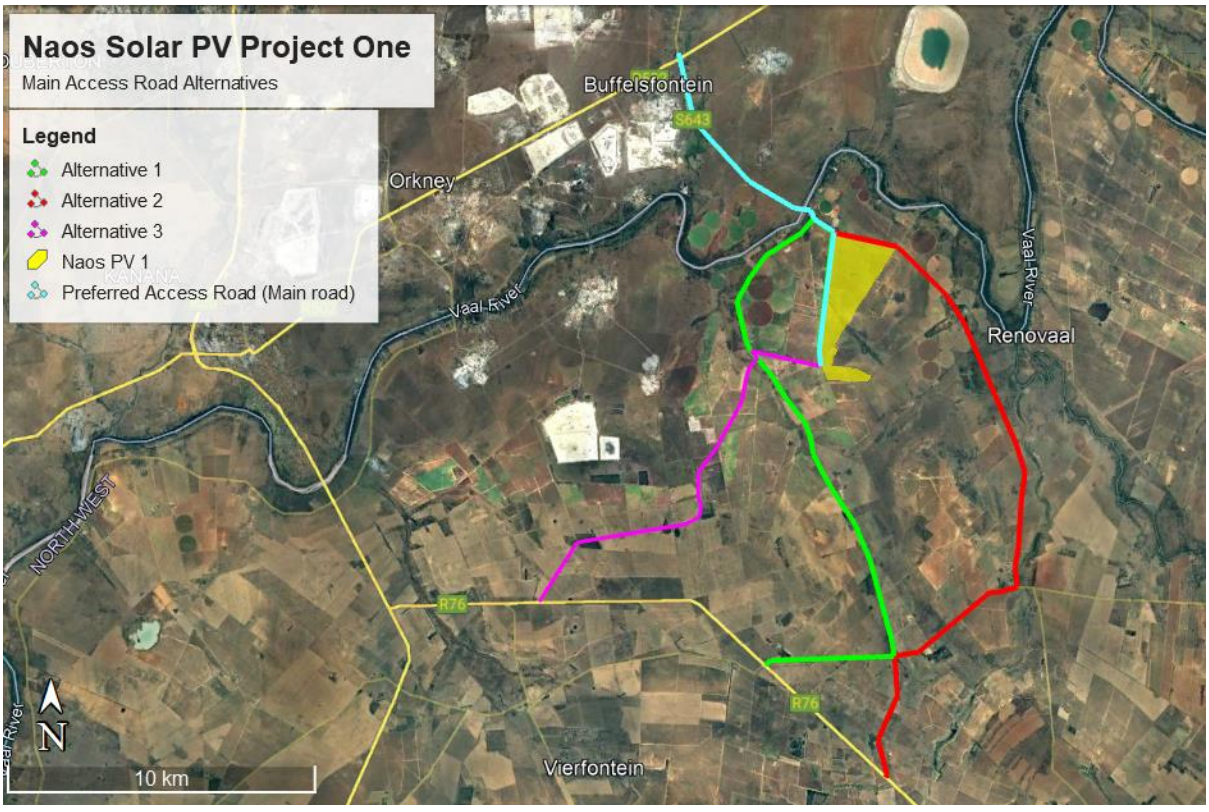


Figure 6.6: Main access route alternatives proposed and under assessment for the Naos Solar PV Project One

Table 6.7 below provides an indication of the preferred alternatives considering the various specialist fields that have assessed the Naos Solar PV Project One and the proposed alternatives. This section also provides an indication of the preferred alternative from an environmental perspective.

Table 6.7: Comparative assessment of alternatives considering the results of the independent specialist reports (Appendix D)

	Terrestrial Biodiversity	Avifauna	Visual	Soil and Agriculture	Heritage	Palaeontological	Social	Wetlands
Grid Connection Corridor Alternatives								
Alternative 1A	Less preferred, more disturbance to wetland feature. Still supported.	Less preferred	The difference in visual impact of all grid connection corridor alternatives is almost negligible.	Less preferred, infringes with areas characterized as "high" sensitivity crop fields.	Acceptable, no sensitivities identified.	No preference as no fossiliferous outcrop was found.	No preference indicated by the specialist	Less preferred, more disturbance to wetland feature. Still supported.
Alternative 1B (technically preferred)	Less preferred, more disturbance to wetland feature. Still supported. Preferred as this is the technically preferred option and is still supported by the specialist	Less preferred	The difference in visual impact of all grid connection corridor alternatives is almost negligible. Based on this the technically preferred option is preferred from an environmental perspective.	Less preferred, infringes with areas characterized as "high" sensitivity crop fields.	Acceptable, no sensitivities identified. Based on this the technically preferred option is preferred from an environmental perspective.	No preference as no fossiliferous outcrop was found. Based on this the technically preferred option is preferred from an environmental perspective.	No preference indicated by the specialist. Based on this the technically preferred option is preferred from an environmental perspective.	Less preferred, more disturbance to wetland feature. Still supported. Preferred as this is the technically preferred option and is still supported by the specialist
Alternative 1C	Less preferred, more	Less preferred	The difference in visual impact of all grid	Less preferred, infringes with areas	Acceptable, no sensitivities identified.	No preference as no fossiliferous	No preference indicated by the specialist.	Less preferred, more

	disturbance to wetland feature. Still supported.		connection corridor alternatives is almost negligible.	characterized as "high" sensitivity crop fields.		outcrop was found.		disturbance to wetland feature. Still supported.
Alternative 2	More preferred, less disturbance to wetland feature.	Most preferred, consolidated with existing linear infrastructure.	The difference in visual impact of all grid connection corridor alternatives is almost negligible.	Less preferred	Acceptable, no sensitivities identified.	No preference as no fossiliferous outcrop was found.	No preference indicated by the specialist.	More preferred, less disturbance to wetland feature.
Alternative 3.	More preferred, less disturbance to wetland feature.	Most preferred, consolidated with existing linear infrastructure. Only a single wetland crossing is relevant.	The difference in visual impact of all grid connection corridor alternatives is almost negligible.	Less preferred	Acceptable, no sensitivities identified.	No preference as no fossiliferous outcrop was found.	No preference indicated by the specialist.	More preferred, less disturbance to wetland feature.
Alternative 4	More preferred, less disturbance to wetland feature.	Most preferred, consolidated with existing linear infrastructure. Only a single wetland crossing is relevant.	Preferred, runs adjacent to an existing power line and receptors might already be desensitised to the existing power line, and see the new	Avoids crop production fields and is located in less sensitive crop fields and is therefore preferred.	Acceptable, no sensitivities identified.	No preference as no fossiliferous outcrop was found.	No preference indicated by the specialist.	More preferred, less disturbance to wetland feature.

			power line as "blending in" on a power line route that is already visually polluted the area. However, the difference in visual impact of all grid connection corridor alternatives is almost negligible.					
Collector Substation Alternatives								
Option 1 (technically preferred)	No preference indicated by the specialist, therefore the technically preferred option, i.e., option 1, is put forward as the environmentally preferred option for authorisation.	Preferred, further away from watercourses	No preference indicated by the specialist, therefore the technically preferred option, i.e., option 1, is put forward as the environmentally preferred option for authorisation.	Preferred	No preference indicated by the specialist, therefore the technically preferred option, i.e., option 1, is put forward as the environmentally preferred option for authorisation.	No preference indicated by the specialist, therefore the technically preferred option, i.e., option 1, is put forward as the environmentally preferred option for authorisation.	No preference indicated by the specialist, therefore the technically preferred option, i.e., option 1, is put forward as the environmentally preferred option for authorisation.	No preference indicated by the specialist, therefore the technically preferred option, i.e., option 1, is put forward as the environmentally preferred option for authorisation.
Option 2		Less preferred		Acceptable				

Main Access Road Alternatives								
Preferred Access Road (Main Road) Alternative 1 Alternative 2 Alternative 3.	No preference indicated by the specialist, therefore the technically preferred option, i.e., use of the preferred access road and alternative 2, are put forward as the environmentally preferred option for authorisation.	No preference indicated by the specialist, therefore the technically preferred option, i.e., use of the preferred access road and alternative 2, are put forward as the environmentally preferred option for authorisation.	No preference indicated by the specialist, therefore the technically preferred option, i.e., use of the preferred access road and alternative 2, are put forward as the environmentally preferred option for authorisation.	No preference indicated by the specialist, therefore the technically preferred option, i.e., use of the preferred access road and alternative 2, are put forward as the environmentally preferred option for authorisation.	No preference indicated by the specialist, therefore the technically preferred option, i.e., use of the preferred access road and alternative 2, are put forward as the environmentally preferred option for authorisation.	No preference indicated by the specialist, therefore the technically preferred option, i.e., use of the preferred access road and alternative 2, are put forward as the environmentally preferred option for authorisation.	No preference indicated by the specialist, therefore the technically preferred option, i.e., use of the preferred access road and alternative 2, are put forward as the environmentally preferred option for authorisation.	No preference indicated by the specialist, therefore the technically preferred option, i.e., use of the preferred access road and alternative 2, are put forward as the environmentally preferred option for authorisation.

When considering the results of the comparative assessment, no major issues have been identified to be associated with any one of the alternatives as per the results indicated in the independent specialist studies.

Furthermore, majority of the specialists have indicated that the technically preferred options for the grid connection corridor, collector substation and main access road are suitable/ no issue has been identified that would consider these technically preferred options as unsuitable for development.

It is therefore confirmed that the environmentally preferred alternatives are as follows:

- Grid Connection Corridor Alternative: Option 1B
- Collector Substation Alternative: Option 1
- Main Access Road Alternative: Preferred Main Access Road and Alternative 2 used together for accessing the site.

6.6 METHOD OF ENVIRONMENTAL ASSESSMENT

The environmental assessment aims to identify the various possible environmental impacts that could results from the proposed activity. Different impacts need to be evaluated in terms of its significance and in doing so highlight the most critical issues to be addressed.

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale i.e. site, local, national or global whereas intensity is defined by the severity of the impact e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence. Significance is calculated as shown in Table 6.8.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

6.6.1 Impact Rating System

Impact assessment must take account of the nature, scale and duration of impacts on the environment whether such impacts are positive or negative. Each impact is also assessed according to the project phases:

- planning
- construction
- operation
- decommissioning

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance should also be included. The rating system is applied to the potential impacts on the receiving environment and includes an objective evaluation of the mitigation of the impact. In assessing the significance of each impact the following criteria is used:

Table 6.8: The rating system

NATURE		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity.		
GEOGRAPHICAL EXTENT		
This is defined as the area over which the impact will be experienced.		
1	Site	The impact will only affect the site.
2	Local/district	Will affect the local area or district.
3	Province/region	Will affect the entire province or region.
4	International and National	Will affect the entire country.
PROBABILITY		
This describes the chance of occurrence of an impact.		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
DURATION		
This describes the duration of the impacts. Duration indicates the lifetime of the impact as a result of the proposed activity.		
1	Short term	The impact will either disappear with mitigation or will be mitigated through natural processes in a span shorter than the construction phase (0 – 1 years), or the impact will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).

3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered indefinite.
INTENSITY/ MAGNITUDE		
Describes the severity of an impact.		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/ component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired. Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.
REVERSIBILITY		
This describes the degree to which an impact can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures.
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.

3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
CUMULATIVE EFFECT		
This describes the cumulative effect of the impacts. A cumulative impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible cumulative impact	The impact would result in negligible to no cumulative effects.
2	Low cumulative impact	The impact would result in insignificant cumulative effects.
3	Medium cumulative impact	The impact would result in minor cumulative effects.
4	High cumulative impact	The impact would result in significant cumulative effects
SIGNIFICANCE		
Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The calculation of the significance of an impact uses the following formula: (Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity. The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.		
Points	Impact significance rating	Description
6 to 28	Negative low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.

6 to 28	Positive low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative high impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive high impact	The anticipated impact will have significant positive effects.
74 to 96	Negative very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive very high impact	The anticipated impact will have highly significant positive effects.

7 CUMULATIVE EFFECTS ASSESSMENT

This section aims to address the following requirements of the regulations:

Appendix 1. (3)(i) An BAR (...) must include-

(j) an assessment of each identified potentially significant impact and risk, including- (i) cumulative impacts.

7.1 INTRODUCTION

The EIA Regulations (as amended) determine that cumulative impacts, "*in relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities*." Cumulative impacts can be incremental, interactive, sequential or synergistic. EIAs have traditionally failed to come to terms with such impacts, largely as a result of the following considerations:

- Cumulative effects may be local, regional or global in scale and dealing with such impacts requires coordinated institutional arrangements;
- Complexity - dependent on numerous fluctuating influencing factors which may be completely independent of the controllable actions of the proponent or communities; and
- Project level investigations are ill-equipped to deal with broader biophysical, social and economic considerations.

Despite these challenges, cumulative impacts have been afforded increased attention in this Basic Assessment Report and for each specialist field a separate section has been added which discusses any cumulative issues, and where applicable, draws attention to other issues that may contextualise or add value to the interpretation of the impact. This chapter analyses the proposed project's potential cumulative impacts in more detail by: (1) defining the geographic area considered for the cumulative effects analysis; (2) providing an overview of relevant past and present actions in the project vicinity that may affect cumulative impacts; (3) presenting the reasonably foreseeable actions in the geographic area of consideration; and (4) determining whether there are adverse cumulative effects associated with the resource areas analysed.

The term "Cumulative Effect" has for the purpose of this report been defined as: the summation of effects over time which can be attributed to the operation of the project itself, and the overall effects on the ecosystem of the site that can be attributed to the project and other existing and planned future projects.

7.2 GEOGRAPHIC AREA OF EVALUATION

The geographic area of evaluation is the spatial boundary in which the cumulative effects analysis was undertaken. The spatial boundary evaluated in this cumulative effects analysis generally includes an area of a 30km radius surrounding the proposed development – refer to Figure 7.1 below and Figure G.

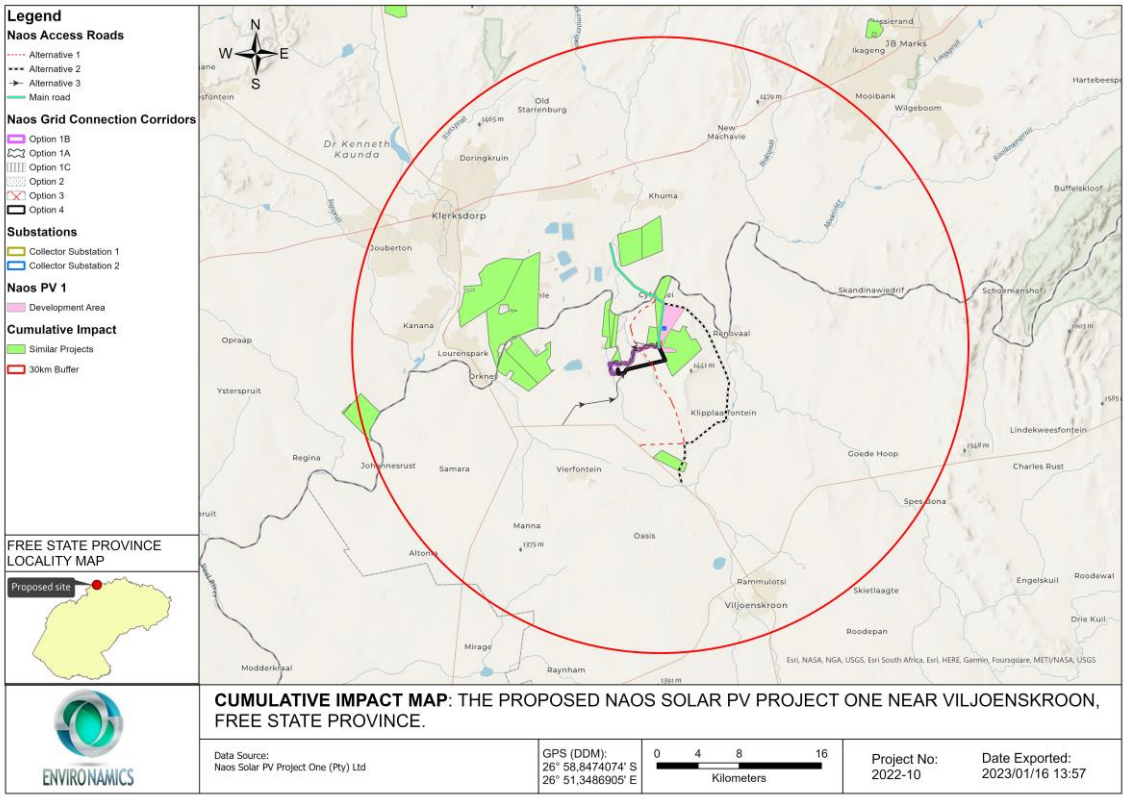


Figure 7.1: Geographic area of evaluation with utility-scale renewable energy generation sites

The geographic spread of solar PV projects, administrative boundaries and any environmental features (the nature of the landscape) were considered when determining the geographic area of investigation. It was argued that a radius of 30km would generally confine the potential for cumulative effects within this particular environmental landscape. The geographic area includes projects located within the Free State Province and North West Provinces. A larger geographic area may be used to analyse cumulative impacts based on the specific temporal or spatial impacts of a resource. For example, the socio-economic cumulative analysis may include a larger area, as the construction workforce may draw from a much wider area. The geographic area of analysis is specified in the discussion of the cumulative impacts for that resource where it differs from the general area of evaluation described above.

7.3 TEMPORAL BOUNDARY OF EVALUATION

A temporal boundary is the timeframe during which the cumulative effects are reasonably expected to occur. The temporal parameters for this cumulative effects analysis are the anticipated lifespan of the proposed project, beginning in 2024 and extending over at least 20-30 years, which is the expected project life of the proposed project. Where appropriate,

particular focus is on near-term cumulative impacts of overlapping construction schedules for proposed projects in the area of evaluation.

7.4 OTHER PROJECTS IN THE AREA

The following section provides details on existing projects, and projects being proposed in the geographical area of evaluation.

According to the DFFE's database twelve (12) PV solar plant applications (of which two applications have lapsed) have been submitted to the Department within the geographic area of investigation, – refer to Table 7.1. It should be noted that there is uncertainty with regards to the accuracy and validity of the information obtained from the Departments database as regular updates are not always applied as the status of projects change.

Furthermore, there are upcoming Basic Assessment processes in the area which is a cluster development proposed by Mulilo Renewable Project Developments (Pty) Ltd.

Table 7.1: A summary of related facilities, that may have a cumulative impact, in a 30 km radius of the study area

Site name	Distance from study area	Proposed generating capacity	DEFF reference	EIA process	Project status
Paleso SPP[3]	11km	150MW	14/12/16/3/3/1/2365	Basic Assessment	Approved
Siyanda SPP	10km	150MW	14/12/16/3/3/1/2369	Basic Assessment	Approved
Thakadu SPP	4km	150MW	14/1216/3/3/1/2476	Basic Assessment	Approved
Ngwedi SPP	9km	150MW	14/12/16/3/3/1/2535	Basic Assessment	In process
Nyarhi SPP	3km	150MW	14/12/16/3/3/1/2533	Basic Assessment	In process
Kabi Vaalkop PV 3	13km	75 MW	12/12/20/2513/3	Scoping and EIA	Approved

[3] Environamics was the EAP responsible for the Basic Assessments for the Paleso, Siyanda, Ngwedi, Nyarhi and Thakadu Solar Power Plants.

Kabi Vaalkop PV 2	12km	75 MW	12/12/20/2513/2	Scoping and EIA	Approved
Kabi Vaalkop PV[4]	11km	75 MW	12/12/20/2513/4	Scoping and EIA	Approved
Kabi Vaalkop PV 1	11km	75 MW	12/12/20/2513/1	Scoping and EIA	Approved
Buffels Solar PV 1	8km	100MW	14/12/16/3/3/2/777	Scoping and EIA	Approved
Buffels Solar PV 2	8km	100 MW	14/12/16/3/3/2/778	Amendment	Approved
Rietvlei solar	16 km	-	14/12/16/3/3/2/450	Scoping and EIA	Withdrawn/Lapsed
Genesis Orkney Solar (Pty) Ltd	24 km	100MW	14/12/16/3/3/2/954	Scoping and EIA	Approved
Afropulse 538 Pty Ltd	7 km	50MW	12/12/20/2280	BAR	Withdrawn/Lapsed
Mulilo Renewable Project Developments (Pty) Ltd (Cluster Development): Vlakfontein Solar PV1 (Pty) Ltd Biesiefontein Solar PV1 (Pty) Ltd Kleinfontein Solar PV1 (Pty) Ltd Zaaiplaats Solar PV1 (Pty) Ltd Hormah Solar PV1 (Pty) Ltd	2.78	75 – 100MW	Projects only in commencement phase with no Applications for EA submitted as yet	BAR	In process (commencement Phase)

[4] The application was only for transmission infrastructure (i.e. substation and power lines) and not a PV solar power plant.

Ratpan Solar PV1 (Pty) Ltd Ratpan Solar PV2 (Pty) Ltd					

It is unclear whether other projects not related to renewable energy is to be constructed in this area, and whether other projects are proposed. In general, development activity in the area is focused on agriculture and mining, with the landscape already transformed by these two existing land use activities. It is quite possible that further solar energy development may take place within the general area in the future.

7.5 SPECIALIST INFORMATION ON CUMULATIVE EFFECTS

In line with the EIA Regulations, specialists were asked to, where possible, take into consideration the cumulative effects associated with the proposed development and other projects which are either developed or in the process of being developed in the local area – refer to Figure 7.2 for a process flow. The following sections present their findings.

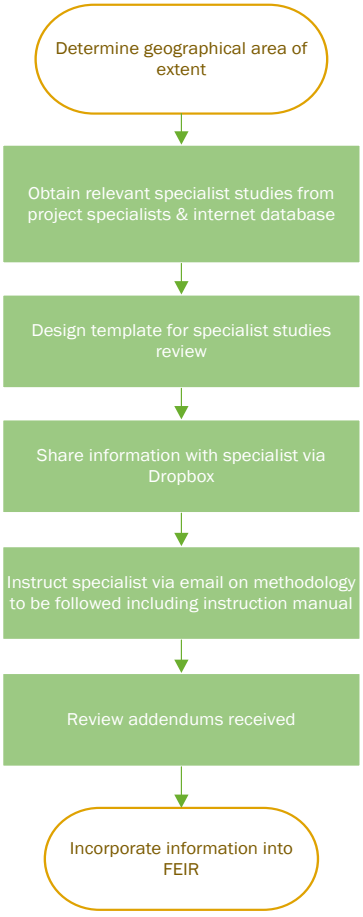


Figure 7.2: Process flow diagram for determining cumulative effects

7.5.1 Soil, Land Capability and Agricultural Potential

According to the Soils and Agricultural Impact Assessment (Appendix D4) cumulative impacts are relevant to both the solar facility and the grid connection.

The cumulative impacts for the solar facility and grid connection corridor in terms of loss of land capability have been scored "Low," indicating that the potential incremental, interactive, sequential, and synergistic cumulative impacts are within acceptable levels. It is probable that the impact will result in spatial and temporal cumulative change. Furthermore, it is indicated that limited residual impacts will be associated with these activities, assuming that all recommended mitigation measures in the report are strictly adhered to by the development. However limited mitigation is required given the fact that the pre- mitigation significance rating has been scored as "Low – Negative" and the post- mitigation significance rating being scored as "Low – Negative".

Because of the negligible agricultural cumulative impact of the proposed development, its cumulative impact will not exceed acceptable levels of change in terms of agricultural land capability loss. The cumulative impact of the development is therefore also assessed as negligible.

7.5.2 Terrestrial Biodiversity Impact Assessment

The Terrestrial Biodiversity Impact Assessment (Appendix D1) has confirmed that the are within which the development is proposed is already impacted by agricultural and mining activities. The development of by itself will not have a significant impact on biodiversity. One must however consider the cumulative impacts of other solar power development projects in the area / vegetation unit. The cumulative impacts on biodiversity may be significant in the long term. It is therefore essential to minimise impacts for each and every development and rather place solar panels in already disturbed areas. Mitigation measures must be implemented which are then site and project specific.

In terms of the impacts identified to be associated with the development the Terrestrial Biodiversity Impact Assessment has indicated the following considering the cumulative assessment:

- Habitat Destruction: Medium significance without mitigation, low significance with mitigation.
- Habitat fragmentation: Low significance without mitigation, negligible significance with mitigation.
- Soil erosion and sedimentation: Medium significance without mitigation, negligible significance with mitigation.
- Soil and water pollution: Medium significance without mitigation, negligible significance with mitigation.
- Air pollution: Low significance without mitigation, negligible significance with mitigation.
- Spread and establishment of alien invasive species: Medium significance without mitigation, negligible significance with mitigation.

- Fauna mortalities: Low significance without mitigation, negligible significance with mitigation.

Overall, the cumulative impact of the proposed development on the natural ecosystems (fauna and flora) would be negligible (with the implementation of appropriate mitigation measures) considering that large sections of the area for development has already been degraded through agricultural activities (crop cultivation, overgrazing and mining etc.). The cumulative impacts are however dependant on the strict implementation of mitigation measures for all solar developments within the area.

7.5.3 Wetland Riparian Impact Assessment

The Wetland Impact Assessment (Appendix D8) has indicated that the solar energy facilities proposed in the area are not proposed to be developed in major wetlands and therefore the cumulative impact on wetlands is not foreseen to be significant.

7.5.4 Avifaunal Assessment

The Avifauna Impact Assessment (Appendix D2) has indicated that cumulative impacts are expected to be associated with the development of the solar facility and the grid connection. The impacts are as follows:

- Loss of priority avian species from important habitats;
- Loss of resident avifauna through increased disturbance;
- Long-term or permanent degradation and modification of the receiving environment resulting to the loss of important avian habitats;
- Collisions with PV panels and power line and electrocution risks leading to injury or loss of avian life which decreases avifauna species diversity; and
- Cumulative displacement of resident avifauna.

The Avifauna Impact Assessment confirms that the cumulative and residual impacts must be prioritised and indicates that the potential impacts in this regard will have a negative low impact environmental significance with the implementation of appropriate mitigation measures. Therefore no unacceptable cumulative impacts ae expected to occur from an avifauna perspective.

7.5.5 Social Impact Assessment

The Social Impact Assessment (Appendix D7) indicates that the potential for cumulative impacts to occur as a result of the surrounding projects, agricultural and mining activities are likely. Potential cumulative impacts identified for the project include positive impacts on the economy, business development, and employment, as well as negative impacts such as a large-scale in-migration of people.

Naos Solar PV Project One and the establishment of other solar power projects within the area has the potential to result in significant positive cumulative impacts, specifically with regards to the creation of a number of socio-economic opportunities for the region, which in turn, can result

in positive social benefits. The positive cumulative impacts include creation of employment, skills development and training opportunities, and downstream business opportunities. The cumulative benefits to the local, regional, and national economy through employment and procurement of services are more considerable than that of Naos Solar PV Project One alone.

While the development of a single solar power project may not result in a major influx of people into an area, the development of several projects may have a cumulative impact on the in-migration and movement of people. In addition, the fact that the project is proposed within an area characterised by good levels of solar irradiation suitable for the development of commercial solar energy facilities implies that the surrounding area is likely to be subject to considerable future applications for PV energy facilities. Levels of unemployment, and the low level of earning potential may attract individuals to the area in search of better employment opportunities and higher standards of living. It is exceedingly difficult to control an influx of people into an area, especially in a country where unemployment rates are high. It is therefore important that the developer implement and maintain strict adherence with a local employment policy in order to reduce the potential of such an impact occurring.

The positive cumulative impacts will be of a medium significance and the negative cumulative impacts will also be of a medium significance.

7.5.6 Visual Impact Assessment

The Visual Impact Assessment (Appendix D3) indicates that the proposed development is located in a close proximity of existing power infrastructure and mines and will have a high cumulative impact on viewers. Other solar energy facilities are also proposed in the area and the potential for cumulative impacts to occur as a result of the projects is therefore very likely. The visual landscape mainly consists of agricultural and mining developments with a low visual quality, except areas along the Vaal River. Permanent residents of the area might be desensitised over time with the construction of more solar energy facilities, but will stay subjective for each viewer. The location of the solar facilities within the study area will contribute to the consolidation of solar power structures to this locality and avoid a potentially scattered proliferation of solar energy infrastructure throughout the region.

The anticipated cumulative visual impact for the solar facility and power line are expected to include the change in sense of place, as well as the precedent being set for solar development in the area where currently there is only a precedent for agricultural and mining related activities. Further construction and operation of the development in the area is likely to have a negative impact.

The significance of the cumulative visual impacts is high due to the current industrial developments in the area (i.e. mining activities), as well as the amount of proposed solar energy development which will further add to the change of the landscape. Cumulative visual impacts expected to occur during the decommissioning of the facility will be of a low significance.

7.5.7 Heritage Impact Assessment

From a review of available databases, publications, as well as available heritage impact assessments done for the purpose of developments in the region, it was determined Naos Solar PV Project One is located in an area with a very low presence of heritage sites and features.

Heritage resources are sparsely distributed on the wider landscape with highly significant (Grade 1) sites being rare. Because of the low likelihood of finding further significant heritage resources in the area of the proposed for development and the generally low density of sites in the wider landscape the overall impacts to heritage are expected to be of generally low significance before mitigation.

The cultural heritage profile of the larger region is very low. Most frequently found are stone artefacts, mostly dating to the Middle Stone Age. Sites containing such material are usually located along the margins of water features (pans, drainage lines), small hills and rocky outcrops. Such surface scatters or 'background scatter' is usually viewed to be of limited significance (Orton 2016). In addition to the Stone Age profile, there is also the Iron Age element. However, this is located well outside the 30km radius, in the Vredefort Dome area and north of Klerksdorp. The colonial period manifests largely as individual farmsteads, in all its complexity, burial sites and infrastructure features such as roads, railways and power lines. For the purpose of this review, heritage sites located in urban areas have been excluded.

For the project area, the impacts to heritage sites are expected to be of medium significance. However, this can be ameliorated by implementing mitigation measures, include isolating sites, relocating sites (e.g. burials) and excavating or sampling any significant archaeological material found to occur within the project area. The chances of further such material being found, however, are considered to be negligible. After mitigation, the overall impact significance would therefore be low.

7.5.8 Paleontological Impact Assessment

In general, development activity in the area is focused on agriculture and mining. It is quite possible that future solar farm developments may take place within the general area.

Solar Facilities in a 30km radius of Naos Solar PV One Project will have a Zero to High Palaeontological Sensitivity. However, it is important to note that the quality of preservation of these different sites will most probably vary and it is therefore difficult to allocate a cumulative sensitivity rating to the projects. If all the mitigation measures are carried out, a conservative estimate of the cumulative impacts on fossil Heritage will vary between low and medium.

7.6 IMPACT ASSESSMENT

Following the definitions of the term, the "residual effects on the environment", i.e. effects after mitigation measures have been put in place, combined with the environmental effects of past, present and future projects and activities will be considered in this assessment. Also, a "combination of different individual environmental effects of the project acting on the same environmental component" can result in cumulative effects.

7.6.1 Potential Cumulative Effects

The receptors (hereafter referred to as Valued Ecosystem Components (VECs) presented in Section 6 (refer to the matrix analysis) have been examined alongside other past, present and future projects for potential adverse cumulative effects. A summary of the cumulative effects discussed are summarized in Table 7.2. Specific VECs have been identified with reference to the Solar Project (Table 6.2), which relates to the biophysical and socio-economic environments.

Table 7.2 indicates the potential cumulative effects VECs and the rationale for inclusion/exclusion.

Table 7.2: Potential Cumulative Effects for the proposed project

	Valued Ecosystem Components (VECs)	Rationale for Inclusion / Exclusion	Level of Cumulative Effect
Construction Phase			
Terrestrial Biodiversity Impact Assessment	Impacts to terrestrial biodiversity	In terms of the impacts identified to be associated with the development the Terrestrial Biodiversity Impact Assessment has indicated the following considering the cumulative assessment: • Habitat Destruction: Medium significance without mitigation, low significance with mitigation. • Habitat fragmentation: Low significance without mitigation, negligible significance with mitigation. • Soil erosion and sedimentation: Medium significance without mitigation, negligible significance with mitigation. • Soil and water pollution: Medium significance without mitigation, negligible significance with mitigation. • Air pollution: Low significance without mitigation, negligible significance with mitigation. • Spread and establishment of alien invasive species: Medium significance without mitigation, negligible significance with mitigation. • Fauna mortalities: Low significance without mitigation, negligible significance with mitigation.	- Low
Wetland Impact Assessment	Impacts on wetland features	The solar energy facilities proposed in the area are not proposed to be developed in major wetlands and therefore the cumulative impact on wetlands is not foreseen to be significant.	- Negligible
Avifaunal Impact Assessment	Cumulative avifauna impacts	Cumulative impacts are expected to be associated with the development of the solar facility and the grid connection. The impacts are as follows: • Loss of priority avian species from important habitats; • Loss of resident avifauna through increased disturbance;	- Low

		• Long-term or permanent degradation and modification of the receiving environment resulting to the loss of important avian habitats; • Collisions with PV panels and power line and electrocution risks leading to injury or loss of avian life which decreases avifauna species diversity; and • Cumulative displacement of resident avifauna.	
Soils and Agricultural Impact Assessment	Loss of land capability	The cumulative impacts for the proposed development in terms of loss of land capability have been scored "Low," indicating that the potential incremental, interactive, sequential, and synergistic cumulative impacts are within acceptable levels. It is probable that the impact will result in spatial and temporal cumulative change. Furthermore, it is indicated that limited residual impacts will be associated with these activities, assuming that all recommended mitigation measures in the report are strictly adhered to by the development. However limited mitigation is required given the fact that the pre- mitigation significance rating has been scored as "Low – Negative" and the post- mitigation significance rating being scored as "Low – Negative".	- Low
Heritage Impact Assessment	Direct or physical impacts, implying alteration or destruction of heritage features within the project boundaries and indirect impacts, e.g. restriction of access or visual intrusion concerning the broader environment.	The cultural heritage profile of the larger region is very low. Most frequently found are stone artefacts, mostly dating to the Middle Stone Age. Sites containing such material are usually located along the margins of water features (pans, drainage lines), small hills and rocky outcrops. Such surface scatters or 'background scatter' is usually viewed to be of limited significance (Orton 2016). In addition to the Stone Age profile, there is also the Iron Age element. However, this is located well outside the 30km radius, in the Vredefort Dome area and north of Klerksdorp. The colonial period manifests largely as individual farmsteads, in all its complexity, burial sites and infrastructure features such as roads, railways and power lines. For the project area, the impacts to heritage sites are expected to be of medium significance. However, this can be ameliorated by implementing mitigation measures, include isolating sites, relocating sites (e.g. burials) and excavating or sampling any significant archaeological material found to occur within the project area. The chances of further such material being found, however, are considered to be negligible. After mitigation, the overall impact significance would therefore be low.	- Low

Palaeontological Impact Assessment	Destroy or permanently seal-in fossils at or below the surface that are then no longer available for scientific study	Solar Facilities in a 30km radius of Naos Solar PV One Project will have a Zero to High Palaeontological Sensitivity. However, it is important to note that the quality of preservation of these different sites will most probably vary and it is therefore difficult to allocate a cumulative sensitivity rating to the projects. If all the mitigation measures are carried out, a conservative estimate of the cumulative impacts on fossil Heritage will vary between low and medium.	- Medium
Social Impact Assessment	Impacts of employment opportunities, business opportunities and skills development	Naos Solar PV Project One and the establishment of other solar power projects within the area has the potential to result in significant positive cumulative impacts, specifically with regards to the creation of a number of socio-economic opportunities for the region, which in turn, can result in positive social benefits. The positive cumulative impacts include creation of employment, skills development and training opportunities, and downstream business opportunities. The cumulative benefits to the local, regional, and national economy through employment and procurement of services are more considerable than that of Naos Solar PV Project One alone.	+ Medium
	Impact of large-scale in-migration of people	While the development of a single solar power project may not result in a major influx of people into an area, the development of several projects may have a cumulative impact on the in-migration and movement of people. In addition, the fact that the project is proposed within an area characterised by good levels of solar irradiation suitable for the development of commercial solar energy facilities implies that the surrounding area is likely to be subject to considerable future applications for PV energy facilities. Levels of unemployment, and the low level of earning potential may attract individuals to the area in search of better employment opportunities and higher standards of living. It is exceedingly difficult to control an influx of people into an area, especially in a country where unemployment rates are high. It is therefore important that the project proponent implement and maintain strict adherence with a local employment policy in order to reduce the potential of such an impact occurring.	- Medium

Visual Impact Assessment	Visual impacts related to the solar facility and power line	The anticipated cumulative visual impact for the solar facility and power line are expected to include the change in sense of place, as well as the precedent being set for solar development in the area where currently there is only a precedent for agricultural and mining related activities. Further construction and operation of the development in the area is likely to have a negative impact.	- High
Operational Phase			
Terrestrial Biodiversity Impact Assessment	Impacts to terrestrial biodiversity	In terms of the impacts identified to be associated with the development the Terrestrial Biodiversity Impact Assessment has indicated the following considering the cumulative assessment: • Habitat Destruction: Medium significance without mitigation, low significance with mitigation. • Habitat fragmentation: Low significance without mitigation, negligible significance with mitigation. • Soil erosion and sedimentation: Medium significance without mitigation, negligible significance with mitigation. • Soil and water pollution: Medium significance without mitigation, negligible significance with mitigation. • Air pollution: Low significance without mitigation, negligible significance with mitigation. • Spread and establishment of alien invasive species: Medium significance without mitigation, negligible significance with mitigation. • Fauna mortalities: Low significance without mitigation, negligible significance with mitigation.	- Low
Wetland Impact Assessment	Impacts on wetland features	The solar energy facilities proposed in the area are not proposed to be developed in major wetlands and therefore the cumulative impact on wetlands is not foreseen to be significant.	- Negligible
Avifaunal Impact Assessment	Cumulative avifauna impacts	Cumulative impacts are expected to be associated with the development of the solar facility and the grid connection. The impacts are as follows: • Loss of priority avian species from important habitats; • Loss of resident avifauna through increased disturbance;	- Low

		• Long-term or permanent degradation and modification of the receiving environment resulting to the loss of important avian habitats; • Collisions with PV panels and power line and electrocution risks leading to injury or loss of avian life which decreases avifauna species diversity; and • Cumulative displacement of resident avifauna.	
Soils and Agricultural Impact Assessment	Loss of land capability	The cumulative impacts for the proposed development in terms of loss of land capability have been scored "Low," indicating that the potential incremental, interactive, sequential, and synergistic cumulative impacts are within acceptable levels. It is probable that the impact will result in spatial and temporal cumulative change. Furthermore, it is indicated that limited residual impacts will be associated with these activities, assuming that all recommended mitigation measures in the report are strictly adhered to by the development. However limited mitigation is required given the fact that the pre- mitigation significance rating has been scored as "Low – Negative" and the post- mitigation significance rating being scored as "Low – Negative".	- Low
Visual Impact Assessment	Visual impacts related to the solar facility and power line	The anticipated cumulative visual impact for the solar facility and power line are expected to include the change in sense of place, as well as the precedent being set for solar development in the area where currently there is only a precedent for agricultural and mining related activities. Further construction and operation of the development in the area is likely to have a negative impact.	- High

Decommissioning Phase			
Terrestrial Biodiversity Impact Assessment	Impacts to terrestrial biodiversity	In terms of the impacts identified to be associated with the development the Terrestrial Biodiversity Impact Assessment has indicated the following considering the cumulative assessment: • Habitat Destruction: Medium significance without mitigation, low significance with mitigation. • Habitat fragmentation: Low significance without mitigation, negligible significance with mitigation. • Soil erosion and sedimentation: Medium significance without mitigation, negligible significance with mitigation. • Soil and water pollution: Medium significance without mitigation, negligible significance with mitigation. • Air pollution: Low significance without mitigation, negligible significance with mitigation. • Spread and establishment of alien invasive species: Medium significance without mitigation, negligible significance with mitigation. • Fauna mortalities: Low significance without mitigation, negligible significance with mitigation.	- Low
Wetland Impact Assessment	Impacts on wetland features	The solar energy facilities proposed in the area are not proposed to be developed in major wetlands and therefore the cumulative impact on wetlands is not foreseen to be significant.	- Negligible
Avifauna Impact Assessment	Cumulative avifauna impacts	Cumulative impacts are expected to be associated with the development of the solar facility and the grid connection. The impacts are as follows: • Loss of priority avian species from important habitats; • Loss of resident avifauna through increased disturbance; • Long-term or permanent degradation and modification of the receiving environment resulting to the loss of important avian habitats; • Collisions with PV panels and power line and electrocution risks leading to injury or loss of avian life which decreases avifauna species diversity; and • Cumulative displacement of resident avifauna.	- Low

Visual Impact Assessment	Visual Intrusion	The decommissioning of the solar facillity and 132kV power line may increase the cumulative visual impact together with farming activities and people using the existing gravel roads adjacent to site increasing the amount of dust generated. Dust control and housekeeping will be the main factors to consider.	- Low
Other	Generation of waste	An additional demand on municipal services could result in significant cumulative impacts with regards to the availability of landfill space.	- Medium

7.7 CONCLUSION

This chapter of the Basic Assessment Report addressed the cumulative environmental effects of the construction, operation and decommissioning project phases. The information to date has shown that no significant adverse residual impacts are likely. However, cumulative impacts could arise as other similar projects are constructed in the area. Majority of the cumulative impacts will be of a medium or low significance, with the exception of visual cumulative impacts, which is of a high significance due to the current industrial developments in the area (i.e. mining activities), as well as the amount of proposed solar energy development which will further add to the change of the landscape.

Considering the extent of the project and information presented in section 7 of this report, it can be concluded that the cumulative impacts will not result in large scale changes and impacts on the environment, especially since the environment and general area has experienced transformation including the undertaking of mining and agricultural activities which has created disconnect between natural systems within the landscape.

Photovoltaic solar energy technology is a clean technology which contributes toward a better-quality environment. The proposed project will contribute to local economic growth by supporting industry development in line with provincial and regional goals and ensuring advanced skills are drawn to the Free State Province. No cumulative impacts with a high residual risk have been identified.

In terms of the desirability of the development of renewable energy, it may be preferable to incur a higher cumulative loss in such a region as this one (which has already been degraded by mining and agricultural activities), than to lose land with a higher environmental value elsewhere in the country. Also, the cumulative impacts expected will not result in a whole-scale change of the environment and therefore are considered to be acceptable, and considering the associated positive impacts associated with the development of solar energy facilities, the proposed facility is considered desirable. It must further be considered that the area is categorised as a Renewable Energy Development Zone which aims to concentrate the impacts of the developments to specific areas so that impacts are not distributed throughout the landscape. There is therefore an opportunity to develop a renewable energy facility in an area where historical land uses have caused degradation to the environment, which will contribute to the generation of clean energy for the country as a whole.

8 ENVIRONMENTAL IMPACT STATEMENT

This section aims to address the following requirements of the regulations:

Appendix 3. (3) An BAR (...) must include-

(l) an environmental impact statement which contains-

(i) a summary of the key findings of the environmental impact assessment:

(ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and

(iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;

(m) based on the assessment, and where applicable, impact management measures from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr;

(n) any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;

(o) a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;

(q) a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;

8.1 SUMMARY OF KEY FINDINGS AND ASSESSMENT RESULTS

Based on the contents of the report the following key environmental issues were identified, which have been assessed and addressed in this draft BA report. The ratings provided gives an indication of the impact significance with the implementation of the recommended mitigation measures.

- Impacts during construction phase:
  - Direct habitat destruction (- Low)
  - Habitat fragmentation (- Low)
  - Increased soil erosion and sedimentation (- Low)
  - Soil and water pollution (- Low)
  - Air pollution (- Low)
  - Spread and establishment of alien invasive species (- Low)
  - Negative effect of human activities and road mortalities (- Low)

- Compaction, soil erosion and sedimentation (- Low)
- Disturbance of watercourse habitat and fringe vegetation (-Low)
- Loss of priority avian species from important habitats (- Low)
- Loss of resident avifauna through increased disturbance (- Low)
- Long-term or permanent degradation and modification of the receiving environment (- Low)
- Loss of land capability (- Low)
- Loss or damage to sites, features or objects of cultural heritage significance (- Low)
- Destroy or permanently seal-in fossils at or below the surface that are then no longer available for scientific study (- Low)
- Visual impact of construction activities of the solar facility and grid connection (- Low)
- Direct and indirect employment opportunities and skills development (+ Medium)
- Economic Multiplier effect (+ Medium)
- Improvement to shared infrastructure (+Low)
- Potential loss of productive farmland (- Low)
- In-migration of people (non-local workforce and jobseekers) (- Low)
- Safety and security impacts (- Low)
- Impacts on daily living and movement patterns (- Low)
- Nuisance impacts (noise and dust) (- Low)
- Increased risk of potential veld fires (- Low)
- Visual and sense of place impacts (- Low)

➢ <u>Impacts during the operational phase:</u>

- Direct habitat destruction (- Low)
- Habitat fragmentation (- Low)
- Increased soil erosion and sedimentation (- Low)
- Soil and water pollution (- Low)
- Air pollution (- Low)
- Spread and establishment of alien invasive species (- Low)
- Negative effect of human activities and road mortalities (- Low)

- Compaction, soil erosion and sedimentation (- Low)
- Disturbance of watercourse habitat and fringe vegetation (-Low)
- Long-term or permanent degradation and modification of the receiving environment resulting to in the loss of important avian habitats (-Low)
- Loss of resident avifauna through increased disturbance (-Low)
- Collisions with PV panels and electrocution risks leading to injury or loss of avian life which decreases avifauna species diversity (-Low)
- Collisions with overhead lines and electrocution risks leading to injury or loss of avian life which decreases avian diversity (-Low)
- Loss of land capability (- Low)
- Loss or damage to sites, features or objects of cultural heritage significance (- Low)
- Potential visual impacts on sensitive visual receptors located within a 1km radius from the solar facility (-Low)
- Potential visual impacts on sensitive visual receptors located within a 1km radius from the grid connection corridor alternatives (-Low)
- Potential visual impacts on sensitive visual receptors between a 1km and 3km radius from the solar facility (-Low)
- Potential visual impacts on sensitive visual receptors between a 1km and 3km radius from the grid connection corridor alternatives (-Low)
- Potential visual impacts on sensitive visual receptors between a 3km and 5km radius from the solar facility (-Low)
- Potential visual impacts on sensitive visual receptors between a 3km and 5km radius from the grid connection corridor alternatives (-Low)
- Potential visual impacts on sensitive visual receptors located between a 5km and 10km radius from the solar facility (-Low)
- Potential visual impacts on sensitive visual receptors located between a 5km and 10km radius from the grid connection corridor alternatives (-Low)
- Lighting Impacts of the solar facility (-Low)
- Solar glint and glare impacts of the solar facility (-Low)
- Visual and sense of place impacts of the solar facility (-Low)
- Visual and sense of place impacts of the grid connection corridor alternatives (-Low)
- Direct and Indirect employment opportunities and skills development (+ Medium)

- Development of non-polluting, renewable energy infrastructure (+ Medium)
- Potential loss of agricultural land (-Low)
- Contribution to Local Economic Development (LED) and social upliftment (+ High)
- Impact on tourism (+/- Low)
- Visual and sense of place impacts (- Low)
- Destroy or permanently seal-in fossils at or below the surface that are then no longer available for scientific study (-Low)

➢ Impacts during the decommissioning phase:

- Direct habitat destruction (- Low)
- Habitat fragmentation (- Low)
- Increased soil erosion and sedimentation (- Low)
- Soil and water pollution (- Low)
- Air pollution (- Low)
- Spread and establishment of alien invasive species (- Low)
- Negative effect of human activities and road mortalities (- Low)
- Long-term or permanent degradation and modification of the receiving environment resulting in the loss of important avian habitats (-Low)
- Displacement of resident avifauna through increased disturbance (-Low)

➢ The cumulative impact for the proposed development is medium to low. Only one cumulative impact of a high significance has been identified and assessed, which relates the cumulative visual impacts within the current landscape. The cumulative impacts will not result in large scale changes and impacts on the environment considering the transformation of the area which has historically been undertaken through agricultural and mining activities.

8.2 SENSITIVITY ANALYSIS SUMMARY AND SITE-SPECIFIC CONDITIONS

The sensitivity analysis has guided the developer in optimising the final layout of the Naos Solar PV Project One through identifying specific environmental areas and features present within the site which needs to be avoided through the careful placement of infrastructure as part of the development footprint. Refer to Section 6.4 for the complete sensitivity analysis and Appendix H for the preferred layout map.

Two wetland types were identified to be associated with the proposed Naos Solar PV Project One:

- Exorheic depression (artificial dam) present within the development footprint of the PV site; and

- Unchannlelled valley bottom wetlands present within the grid connection corridor alternatives.

As the exorheic depression (artificial dam) is a man-made feature no avoidance is required and therefore the development footprint has been placed over this feature. The power line connection and service roads will cross two valley bottom wetlands. This can be supported if disturbance in these features is kept to a minimum.

Further mitigation measures for the development, as recommended by the independent specialists, have been included in the EMPr(s) for the project as per Appendix F1-F4.

8.3 TECHNICAL DETAILS OF THE PROPOSED INFRASTRUCTURE TO BE AUTHORISED

- PV Panel Array - To produce up to 300MW the facility will require numerous linked cells placed behind a protective glass sheet to form a panel. Multiple panels will be required to form the solar PV arrays which will comprise the PV facility.

- Battery Energy Storage System (BESS) – The battery energy storage system will make use of Lithium-ion (Lithium Iron Phosphate / Sodium Sulphur) or Vanadium Redox technology and will have a capacity of up to 4.5GWh. The extent of the system will be ~4.57ha. It must be noted that should the facility layout not require the development and operation of a BESS, the area allocated for the placement of the BESS will be used for panel placement within the development footprint.

- Inverters - Sections of the PV array will be wired to inverters. The inverter is a pulse-width mode inverter that converts direct current (DC) electricity to alternating current (AC) electricity at grid frequency.

- Connection to the grid - Connecting the array to the electrical grid requires the transformation of the voltage from 33kV to 132kV. The normal components and dimensions of a distribution-rated electrical substation will be required. A collector substation with a capacity of 33kV/132kV will also be required.

  The onsite substation will be required on site to step the voltage up to 33kV/132kV, after which the power will be evacuated into the national grid via the new proposed power line from the proposed collector substation to the 132/400kV Mercury Main Transmission Substation (MTS).

  A collector substation will be developed. It must be noted that Option 1 is the preferred option from an environmental perspective (as assessed in Section 6.5 of this BA Report). Specific internal power lines to connect the collector substation to the main grid connection corridor, which will ultimately evacuate the generated power into the national grid, is also being proposed as part of the required grid connection infrastructure.

  The capacity of the collector substation will be 33kV/132kV and the capacity of the internal power lines will be 33kV/132kV.

  The 132kV power line to connect the facility to the 132/400kV Mercury Main Transmission Substation is under assessment within a 200m wide grid connection

corridor. Alternative 1B has been identified as the preferred option from an environmental perspective (as assessed in Section 6.5 of this BA Report).

- Electrical reticulation network – An internal electrical reticulation network will be required and will be lain ~2-4 m underground as far as practically possible.
- Supporting Infrastructure – The following auxiliary buildings with basic services including water and electricity will be required on site:
    - Operations & Maintenance Building / Office (~2510m²);
    - Switch gear and relay room (~800m²);
    - Staff lockers and changing room (~200m²);
    - Security control (~60m²);
    - Permanent Laydown Area (~10ha); and
    - Temporary batching plant
- Roads – Access will be obtained via the existing Vermaasdrift Road, R59, R501 and S643 roads. The technically preferred alternatives are the use of the Main Road and Alternative 2 collectively for the project as these two options provide the most technically sensible solution for the transportation of goods and services to and from the sites, including consideration of the road requirement for the transportation of the transformer. It is therefore requested that the Main Road and Alternative 2 both be authorised for the developments. The use of these roads are also preferred from an environmental perspective.

  An internal site road network will also be required to provide access to the solar field and associated infrastructure. Internal access roads will be up to 12m in width. The main access road providing direct access to the project will be up to 8m wide and 6km long.
- Fencing - For health, safety and security reasons, the facility will be required to be fenced off from the surrounding farms. The project will have permanent security on site for 24hrs per day, 7 days a week.

8.4 RECOMMENDATION OF EAP

The final recommendation by the EAP considered firstly if the legal requirements for the EIA process had been met and secondly the validity and reliability of the substance of the information contained in the BA report. In terms of the legal requirements it is concluded that:

- All key consultees have been consulted as required by Chapter 6 of the EIA Regulations (as amended)
- The Basic Assessment process has been conducted as required by the EIA Regulations (as amended), Regulations 19 and Appendix 1.

- The EMPr was compiled in conjunction with the Generic EMPr for overhead electricity transmission and distribution infrastructure as per Government Notice 435, which was published in Government Gazette 42323 on 22 March 2019.
- The EMPr was compiled in conjunction with the Generic EMPr for the development of the associated substation infrastructure for transmission and distribution of electricity as per Government Notice 435, which was published in Government Gazette 42323 on 22 March 2019.
- The EMPr was compiled for the Naos Solar PV Project One as per Appendix 4 of the EIA Regulations (GN.R. 326), published in Government Gazette 40772 on 07 April 2017.
- The proposed mitigation measures will be sufficient to mitigate the identified impacts to an acceptable level.
- The development on the affected property will create agricultural opportunities for the landowner which will assist the landowner in the current climatic and economic conditions experienced. There will be a benefit for the Waterford Boerdery Trust but also the community through the creation of additional employment opportunities in agriculture. The development is therefore highly desirable not only for the Country, but also for the developer, the landowner and the community as a whole.
- It is recommended that the following alternatives be authorised as per the comparative assessment of alternatives undertaken in Section 6.5:
    - Grid Connection Corridor Alternative: Option 1B
    - Collector Substation Alternative: Option 1
    - Main Access Road Alternative: Preferred Main Access Road and Alternative 2 used together for accessing the site.

In terms of the contents and substance of the BA report the EAP is confident that all key environmental issues were identified, assessed and appropriate mitigation measures recommended for the reduction of the impact significance expected to occur. These key issues have been adequately assessed during the BA process to provide the competent authority and registered I&APs with sufficient information to allow them to provide comment and raise any further potential issues.

The final recommendation of the EAP is that:

It is the opinion of the independent EAP that the proposed development will have a net positive impact for the area and will subsequently ensure the optimal utilisation of resources and land, specifically in an area which has been transformed through historical agricultural and mining activities. All negative environmental impacts can further be effectively mitigated through the proposed mitigation measures.

Based on the contents of the report it is proposed that an environmental authorisation be issued, which states (amongst other general conditions) that the Naos Solar PV Project

One and associated infrastructure on Portion 1 of the Farm Waterford No. 573, Registration Division Viljoenskroon, Free State Province be approved subject to the following conditions:

- Implementation of the proposed mitigation measures set out in the EMPr(s).
- Implementation of the proposed mitigation measures set out in the specialist studies.
- The proposed solar facility must comply with all relevant national environmental laws and regulations.
- All actions and tasks allocated in the EMPr(s) should not be neglected and a copy of the EMPr(s) should be made available onsite at all times.
- It is recommended that the following alternatives be authorised:
    - Grid Connection Corridor Alternative: Option 1B
    - Collector Substation Alternative: Option 1
    - Main Access Road Alternative: Preferred Main Access Road and Alternative 2 used together for accessing the site.
- A detailed Geotechnical Assessment must be undertaken for the development footprint as part of the micro-siting of the layout.
- Should archaeological sites or graves be exposed during construction work, it must immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made.

We trust that the department finds the report in order and eagerly await your comment and input in this regard.

Lisa de Lange

Environamics - Environmental Consultants

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